RAILROAD GAZETTE

FRIDAY, MAY 18.

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Contributions.

Craven's Traction Increaser.

CHICAGO, Ill., May 8, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

You article in issue of May 4 regarding Craven's Traction Increaser on the Erie is incorrect regarding weight on drivers. The weight on the two rear pair of drivers was 9,500 lbs. less than on the two front pairs and not 950 lbs., as stated. The article infers that it was taken off from engine 604 and applied to another, which was not the fact. After three weeks trial on that engine they instructed me to equip one of another class as stated. NELSON LYON, Prest.,
Albany Locomotive Appliance Co.

The Earliest Chilled Wheels.

PHILADELPHIA, Pa., May 10, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have lately noticed the topic "Chill" in the "Car-Builders' Dictionary," last edition. It is there said that "chilling was invented in Philadelphia in 1847." This is an error that ought to be corrected in the next edition. Mr. Geo. G. Lobdell made *chilled wheels* in 1833, I think. His works were established in 1836. Several others made them between 1830 and 1847. Mr. Asa Whitney first applied *annealing* to car wheels in Philadelphia in 1847, and this is probably the occasion of the error. J. S. WHITNEY.

The Kansas City Elevated Railroad.
(Inter-state Rapid Transit.)

A correspondent has asked for information as to some particulars in which the structure of the Kansas City Elevated road may be considered superior to that of the New York lines. The following letter is from the engineer who designed the structure, while Engineer of Bridges and Buildings for the Edge Moor Iron Co.:

NEW YORK, May 9, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

To your inquiry regarding the Kansas City Elevated Railroad I would reply as follows:

The road was built in the summer of 1886. Coming some 10 years after the New York roads, the structure might naturally be expected to embody some improvements, and it is believed that it does.

The material is steel, used at stresses ordinarily allowed in iron, which gives it a large reserve strength. The standard span is 48 ft. (about 20 per cent. longer than in New York).

The main feature of the structure is the absence of cross ties. Each rail is supported in a steel trough formed of two channels, connected together with bent plates near the bottom at short intervals in the length. Upon these plates rest wooden blocks 1½ in. thick, and upon these the rail, confined by bolts passing through the blocks and tie plates. The blocks may be replaced from below without removing the rail. The wood is used only as a cushion, the amount in an entire span being but little more than is contained in one cross-tie of the New York roads.

The trough carrying the rail forms the top chord of the longitudinal truss, which has an eyebar bottom chord and triangular web bracing, all connected with large pins, in order to avoid secondary strains and to prevent wear.

The troughs are stiffened and braced laterally by angle iron diagonals riveted between them.

There is the minimum obstruction to light, through the disuse of cross-ties, and the tunnel-like appearance of the street under the structure is avoided. At the same time the greatest safety is insured; the wheels being in troughs, are prevented from leaving the rails, and in the event of a broken axle the truck drops on what is in effect a pair of steel skids.

As was predicted, on account of the small amount of wood used and general character of the structure, the passage of trains is accompanied with very little noise.

GEO. H. PEGRAM.

The Strong Boiler and American Workmen.

The Strong Locomotive Company,
NEW YORK, May 11, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I was pleased to see your note on the comment of the editor of *The Engineer* on American locomotive builders.

As to his other remark, "we may go further now, and add that the boiler will probably fail in the fire-boxes," I am glad that he said it, as it shows the pure cussedness of the spirit that actuates this editor.

Let us go back a little in the history of these fire-boxes and see what was and is being done on both sides of the water, in the way of making furnaces. When we commenced the construction of the boiler of 444, we desired to get furnaces 9 ft. long and made drawings of furnaces that length, and furnished them to the Edge Moor Iron Company, who forwarded copies to the agents of the Leeds Forge Company, who took the order. After a delay of two months, we were informed that they could not be made that length, but that we must be satisfied with furnaces 8 ft. long. We then ordered them that length, and welded and riveted on a short piece to the end next the fire door. When they arrived, one had one more corrugation than the other, but fortunately, there was metal enough so that we put another corrugation in by hand with hammers and swedges. Believing that our only hope was in having these furnaces manufactured on this side of the Atlantic, we were instrumental in starting the manufacture of them here, and are now enabled to get a furnace of any length or diameter, or thickness, and the new furnaces made for 444 were made in one piece, 9 ft. long, with metal enough for flanging out for making the Adamson joint. Some have been made for government gunboat boilers 11 ft. long, and a lot are now being made for water-works at Minneapolis 16 ft. long. Furnaces are also being made and welded on to the tube sheet of return tubular or Scotch marine boilers, thereby doing away with rivets around the place where a riveted seam is most likely to give trouble, and which has been one of the most troublesome questions connected with the use of corrugated furnaces in marine boilers.

If our friend of *The Engineer* will come over here, we will show him many other examples of what would be considered very difficult work, even in England. We will show him locomotive boilers without any rivets exposed to the fire and without laps, so that nowhere is there more than a single thickness of metal between the fire and the water, with all longitudinal seams welded, and welded so as to make the weld as strong as any other part of the boiler.

Finally, as to the petty feeling that is manifest as to what can and cannot be done here, *The Engineer* should remember that the best of England's workmen, as well as those of every other country of Europe, are here, and have brought all the knowledge of those countries with them, and when they are here if they have any knowledge that is of value it is appreciated; and the man, if he has anything in him, has a chance that he could never have under the social conditions of Europe, hence a greater incentive toward effort, which has had the effect of putting this country at the head in many branches of the arts and sciences.

GEO. S. STRONG.

The Westinghouse Compound Engine.

PITTSBURGH, May 8, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice with pleasure your review of some of the results of our tests on the Westinghouse compound engine, together with your comments on the same. From the latter I would infer that you would be interested to know of the method and apparatus employed in the tests. The compound engine was on our testing floor for some months, and the tests, therefore, covered a considerable range as to their period, and were in all particulars as rigorous and comprehensive as we could devise. Steam was taken from the dome of a locomotive boiler which was fired by natural gas; hence the steam pressure was very thoroughly under control and could be maintained at any desired point automatically, with little or no fluctuation. When the engine was worked under its heaviest load the boiler was severely forced, and the steam appeared to be moderately wet. Indeed, there were evidences of considerable moisture in the steam under all loads; but no account was taken of the water so entrained, and which, therefore, was included in the duty so tabulated.

The water measurements were made by exhausting into a surface condenser, which was left open to the atmosphere in the non-condensing tests and closed in the condensing tests. A series of preliminary tests was made, indicating that the limits of time had no effect on the duty after the engine became heated up. For convenience, therefore, the several tests, which were very numerous, were for short periods of from 15 minutes to 1 hour. At the end of each test the water was carefully drawn from the condenser; and the weight divided by the horse-power developed, and corrected for the duration of the test became the immediate expression of the duty. Thus any inaccuracies in the test were against the engine, since the condenser must necessarily contain all entrained water and products of condensation, either in the steam pipe or cylinders. When condensing, vacuum was maintained by an ordinary locomotive air pump, built by the Westinghouse Air Brake Co. and adapted to this duty. The steam employed to operate the air pump was not accounted for; hence the results condensing are shown subject to the amount of power thus consumed, which, however, would be very small.

I notice by your article that you question the possibility of maintaining the load with such uniformity as that tabulated, and assume that the figures must be average results of a large number of tests. In this latter assumption you are correct, but not in the former. The load was obtained by means of a Prony friction brake, consisting of blocks of wood bolted on to a flexible band and clamped with varying force around the rim of a special wheel by means of a right and left hand screw. The brake bore upon the platform of a well adjusted scale, and of course the amount of load was readily determined by calculating through the leverages to the weight upon the scale beam. The brake itself was well and constantly lubricated by suet packed between the blocks, and the frictional heat was taken care of by a constant circulation of cold water maintained through the band wheel, which had edges lipped on the inside. Of course, at the speed at which the engine ran, water would be kept against the rim by centrifugal force, circulation being maintained by a hose and scoop. By this means the power could be kept under almost exact adjustment. The attendant's duty was to watch the scale beam carefully, and adjust the right and left hand screw to keep it constantly in balance. This method of testing is regularly employed on every engine which leaves our shops, and our men, in consequence, have become very adept in the manipulation of the apparatus. The engine, of course, was provided with a pair of indicators, and simultaneous readings were taken to check the brake readings, ascertain the frictional loss, the steam distribution, etc.

It may be interesting to know that the compound engine was designed by a process the reverse of the usual methods; that is to say, the first work was to lay out an indicator diagram, which should possess the highest theoretical possibilities. Such a diagram, having been made and trimmed at until it was satisfactory in all respects, the drawings were next put in hand, and the proportions of the valve and the functions of the valve motion were planned to secure the results delineated on the card. As an evidence of the good understanding of the conditions of steam economy enjoyed by modern engineering, it is pleasant to note that the engine on its first trial described indicator diagrams which were almost the exact duplicates of the templates laid out. It is also interesting to note that the doing away of the intermediate receiver has almost obliterated free expansion between the cylinders. The coincidence of the back pressure line on the high pressure cylinder and the expansion line on the low pressure cylinder is also very remarkable.

WM. LEE CHURCH, C. E.

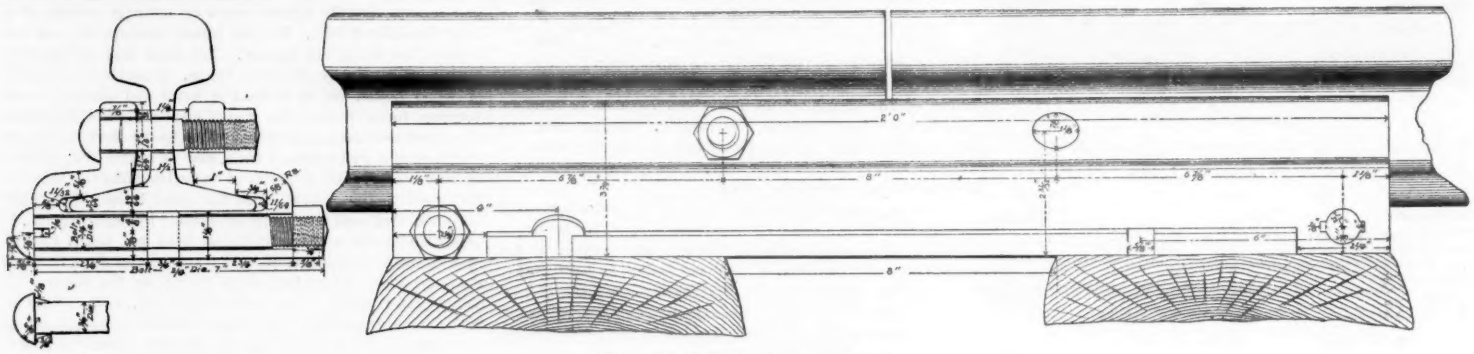
Workingmen's Trains.

The Canadian Pacific Railway Company,
COMMERCIAL AGENT'S OFFICE,
CHICAGO, May 14, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have just read your admirable article on workingmen's trains, and while I do not see that it could well be improved upon, the original difference of opinion between your review of my first articles on the subject of commutation business and my fundamental argument is revived by this article, and I think very clearly evidences that my argument was sound. In the review of my article it was contended that passenger traffic could not, like freight, be classified. I contended that unless it was classified on a comparative social basis its requirements could not be met, and the benefit of so meeting all these social possibilities and requirements was thereby lost, and a large revenue was thereby dormant. Workingmen are a distinct social element from a traffic standpoint. They are a class requiring to be classified in the tariffs of railroad transportation. In classifying freight the whole question really is graduating rates to suit *commercial* requirements, and in classifying passenger traffic similarly the question is one of graduating rates to suit *social* requirements. Passenger traffic is just as capable, in my judgment, of classification as freight is. There are the working classes, the commercial travelers, the school children, the suburban travelers, the tourists, the excursionists, properly so-called (that is, large bodies going out and back on special holiday trips); the conventions, the clergy, and, in fact, all the phases of social and commercial conditions existent and prospective. The workingmen's is *one* of these, and is worthy of careful analysis, so as to lay down some satisfactory ground work upon which the railroads may use its existence to win revenue and promote the well being of the community. I think my articles, as reproduced in the pamphlet form, fully covered all this question in as far as the governing principles were concerned, and it is my opinion to-day that owing to the very little scientific study given to the question of passenger transportation and traffic by the men engaged in its conduct so little progress is made toward the adoption of any thoroughly comprehensive schedule of commuted rates. The commuted rate table of such a line as the New York Central, or the Erie, or the Pennsylvania, or the great lines having the great cities for terminal or initial points on their routes, should be so comprehensive as to cover all the current requirements of the community as well as be designed to create by foresight larger traffic in the future. As a practical illustration, in your article the following occurs: "A workman cannot readily take advantage of the commutation system as arranged at present." Why? Because it is not thorough. The table, if properly compiled and developed, would make it a temptation, not an obstacle, to take advantage of its provisions.

If a workman wants to get the advantage of a yearly rate, which is naturally very much less than a monthly rate, as in any commercial transaction, is a natural and common sense rule—then it is easy on a perfected contract table to start him in at a weekly rate and keep track of his purchases,



THE THOMSON RAIL JOINT.

Made by the CAMBRIA IRON CO., *Johnstown, Pa.*

graduating the installments as he increases his mileage. The average passenger man will say that is too complicated and will spend hours over some far less productive and far more complicated table of through rates and tours and expensive advertising. I trust I have made myself clear. Perhaps I ought to have kept up the publication of these matters until they had been fully realized and grasped and admitted, but that is something which demanded too severe a criticism of the men and the times and was more than I was able to undertake or justified in undertaking.

Passenger traffic has never yet been studied properly to fulfill its true status in the economy of transportation. It is the means of doing great good and acts as an educator. It has its two mental forms, the narrow or tory side, and the progressive or liberal side; but so long as railroads are organized for stock purposes and not for traffic, for construction profits and not for revenue, so long will the conduct of railroads evince a great lack of any sympathy with men who are students of the economy and science of passenger, or, for the matter of that, of any, transportation.

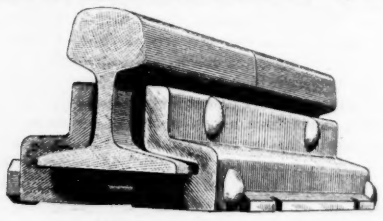
Feeling this I have decided that time must elapse before progress in the direction of the reforms indicated can be hoped for. J. FRANCIS LEE.

[The point at issue between Mr. Lee and the *Gazette* is largely a matter of names. On practice, we should probably nearly agree; he simply insists that such practice involves the principle of classification. Perhaps it does; but the form which such a principle would take in passenger business is so different from its recognized application in the freight business that most people would be misled by using the same word for the two things.—EDITOR RAILROAD GAZETTE.]

The Thomson Rail Joint.

The joint shown in the accompanying illustrations was designed about 18 months ago and is patented by Mr. M. W. Thomson, Engineer of Maintenance of Way, Pennsylvania Railroad, and is made by the Cambria Iron Company. It is in use for trial on about two miles of the Pennsylvania, and one mile has just been rolled for the Chicago & Northwestern.

The illustrations show the joint in prospective, a sectional elevation and a side elevation, and no description is necessary. As here shown the joint weighs 80 lbs. The punching of the holes for the bolts through the web is varied. As shown here the joint is punched for the Pennsylvania 4-hole rail. Others are punched 14 in. apart, to fit the middle holes of the 6-hole rail. Other variations from these drawings have not been made so far, but Mr. Thomson has some expectation of dispensing with the long bolts through the base, and joints without those bolts are now in track for trial.



One feature of this joint which is considered particularly valuable is the extent to which it can be adjusted for wear by tightening the bolts. As wear proceeds a tight joint can always be secured by drawing the two parts up on the flange, and this play makes it possible to apply a joint of one section to rails of different weights. It is suggested further that with rails of unusually thin flanges thin packing strips of sheet iron can be inserted. One make of joint can be applied to rails varying between 56 and 75 lbs.

The joint has the great advantage of getting the bearing on the foot of the rail instead of under the head, and offers a large bearing surface. Not only is the wear of the joint thus reduced, but most of strain is taken off the bolts. A certain advantage is claimed, and will probably be realized, in that the spring of the plates will keep a uniform elastic strain on the nuts, dispensing, perhaps, with nut locks. The joint is unusually deep, and has great vertical strength, but whether or not it will need added strength in the middle, at the top of the vertical member, remains to be proved. This could easily be provided by giving it a flange. The two parts are symmetrical and interchangeable, and the whole joint, as will be seen, comprises but the two bars and four bolts. As has been said, it is proposed to try to dispense with the lower bolts.

The following transverse tests were made of a Pennsylvania Railroad standard 75-lb. rail and a joint composed of this rail with Pennsylvania standard 1887 six-hole angle splice bars, and the same rail with the Thomson joint, showing the Thomson joint to have 70 per cent. of the elastic limit of the solid rail 4¾ in. high, and 47 per cent. more than that of an extra heavy ordinary form of angle joint, with correspondingly great stiffness both under and above the elastic limit. Ends of rails from $\frac{3}{16}$ in. to ¼ in. apart in all cases:

	Laboratory No.	Elastic limit. Load. Lbs.	Elastic limit. Deflection. In.	Max. resistance. Load. Lbs.	Max. resistance. Deflection. In.	Distance centre to centre of bearings. In.
75-lb. steel rail, 4¾ in. high, 4½ in. base	2,904	116,000	.0653	140,000*	.137	20
Penn. R.R standard six-hole iron splice bars, 51½ lbs., 34 in. long, on same rail	2,944	45,000	.1173	78,000*	.548	20
Thomson splices, 80 lbs., 24 in. long, on same rail	2,905	85,000	.0909	145,000†	.185	20

* Test discontinued with load still rising.
† Load still rising. At 146,000 sudden slip with loud noise first occurred. Test discontinued.

Interlocked Switches and Signals.

BY CHARLES R. JOHNSON, C. E.

II.

The growth of interlocking in the past two years has been principally at small places, that is junctions, grade crossings, draw-bridges, etc., and this has been mainly due to the introduction of cheaper appliances for operating switches and signals at such points.

The know-nothing stop has been a source of annoyance and expense to railroads for a long time, and any safe means of avoiding it was eagerly sought for. It is doubtful if any real safety is obtained from the know-nothing stop. Collisions have frequently occurred notwithstanding obedience to the rule. If an engine man has no proper signals, or disregards them, a disastrous collision may occur notwithstanding a stop 500 or 1,000 feet from a crossing.

Several states have passed laws authorizing railroads to run their trains over draw-bridges and grade crossings provided interlocking signals are fixed at such points, and have been examined and approved by an officer duly appointed by the state. These laws have been taken advantage of quite extensively, and many bridges and crossings equipped with interlocking.

DERAILING SWITCHES.

The first question to arise in connection with this subject was the desirability of using "derailing" or "throw-off" switches. Notwithstanding the safeguards that are used with facing switches, it is almost an axiom with signal experts to avoid facing switches where possible, and for this reason and the fact that unless signals are obeyed by enginemen, accidents will occur, signal engineers are almost, if not quite, unanimous in their opposition to derailing switches in the main track of a railroad, except for draw-bridges and intervolved track on a bridge, and then only when the "derailing switch" leads on a siding where an overrunning train has an opportunity to stop.

Opinion amongst railroad officers is divided as to the question of using derailing switches in main tracks. In several states railroad commissioners insist upon their use, but in others, notably New York and Massachusetts, the commissioners leave the matter to be decided by the officers of the railroads interested. It is not the object of this article to give the reasons for and against derailing switches, but attention may be drawn to some of the principal ones. Those who favor the use of derails in main tracks argue that if an engine man disobeys his signal he ought to be ditched, and with the knowledge before him that if he does run against a danger signal he will be thrown from the track, he is much more likely to look out for and obey his signals than he would be without such knowledge. Those who oppose derailing switches in the main track say that it is only inviting disaster to throw a train off the track when an engineman disobeys a signal. It certainly does not follow that because a signal is at danger the opposing track is necessarily blocked, and the advocates of reliance on signals only claim that there is no safety except by discipline and absolute obedience to signals. So far as can be ascertained, there have been more cases of enginemen running past danger signals when reinforced by derailing switches than when they have had signals only. If such is the case, it would seem to prove that better discipline is maintained on the roads without derailing switches, although, on the other hand, when an engine is ditched it is generally known at headquarters, whereas men running past a danger signal and causing no damage are not always reported.

The advocates of no derailing switches sometimes carry their theory to the extent of not permitting side tracks to be equipped with them. This would seem to be going too far, because scarcely any damage would be done to a derailed train attempting to leave a siding in the face of a danger signal on account of the slow rate of speed at which the train would necessarily be running.

It seems a very safe and desirable rule to have all sidings equipped with derailing switches arranged in such a way as not to obstruct the main track when a car or engine is derailed, not only to prevent enginemen coming out against their signal, but to prevent the danger of cars being blown or pushed out foul of the main.

With ordinary interlocking appliances the use of derailing switches at grade crossings and drawbridges entails considerable extra expense. For example, at a single track grade crossing with home and distant signals in each direction and without derails, eight interlocking levers only would be required, one being for each signal. If, however, derails are used, fourteen levers would be required to give perfectly satisfactory results, eight levers being for the signals, two for the four switches and four for the four facing point locks, making fourteen levers in all.

There are several ways of reducing this number of levers, but none perfectly satisfactory. The most usual method is to work a facing point lock and home signal by one lever, but this is open to the objection that when a train is stopped for any reason whatever on the facing switch, after having a clear signal, the signal cannot be put to danger so long as the train stands on the switch and the detector bar. In this way the rear of the train is not protected, in fact it may be said that a following train is invited to run into it for a clear signal is shown, although the track is obstructed.

THE CAPSTAN WHEEL.

The cost of equipping grade crossings on the above principle was so high as to prevent railroad companies from taking advantage to any great extent of the laws allowing them to run the crossings without first making a stop.

To reduce the cost to any great extent it was necessary to have a cheaper machine and cheaper connections. This was done by the invention of Mr. Henry Johnson, which consists of capstan wheels instead of levers, and wire connections entirely instead of part wire and part pipe. A large number of these machines has been manufactured and put into service by the Union Switch & Signal Co., and while their actual use has demonstrated some weaknesses, all of which can be remedied, the principle has proved so satisfactory that there is no doubt they will be used almost exclusively for simple systems of signaling.

A complete description of this device will be given at another time, but briefly stated the capstan wheel does the work of four levers. It has five positions and works switch, facing point lock, home and distant signals. When setting the track and signals for a train the capstan wheel is pulled by the operator and first the switch set, then the facing point lock, then the home signal and last the distant signal. By these separate movements the capstan wheel gives exactly the same results as levers would, except that the latter can be handled much more rapidly. For that reason it is probable that levers will always be used at places where trains are required to be handled rapidly. The connections to the switches and signals consist of a continuous cable from the capstan wheel to the distant signal, connecting by means of a motion plate the switch and facing point lock, and the home signal by means of a rotary wheel, of which one is also fixed on the distant signal.

Four of these capstan wheels are required for a plain single or double track crossing having derailing switches. Two capstans only are required when there are no derailing switches. If there are no derailing switches and no distant signals, one capstan wheel will work the four signals, but in this case the two signals that are not conflicting are lowered at the same time.

The interlocking between the wheels is done just as it would be between levers and on the Stevens principle. This arrangement is certainly the cheapest that has been devised giving complete interlocking.

Erection of the Superstructure of the Forth Bridge.

This account of the erection of the superstructure of the Forth Bridge is slightly abridged from a paper read before the Institution of Engineers and Shipbuilders in Scotland by Mr. Andrew S. Biggart, C. E., and published in a late number of *Industries*, to which journal we are also indebted for the illustrations. Although the general characteristics of the superstructure have been often described, Mr. Biggart's brief outline will be a convenient memorandum for such of our readers as have not followed the work closely.

The Steel Piers.—These piers form three groups, and the skewbacks in each are so placed, in relation to one another, as to represent a rectangle. In each of these groups there are four skewbacks. They carry the entire superstructure, consisting of the steel pier overhead and the cantilevers on each side of the pier. The skewbacks in each set are connected to one another by tubes and heavy lattice girders. The tubes run parallel to the centre line of the bridge, the lattice girders at right angles and diagonally to the same centre. The vertical columns (improperly so called) are 12 ft. in diameter, and spring from the skewbacks. Each pair of these columns batters toward the centre of the bridge as they rise, being 120 ft. apart at their base and 33 ft. at the top. The box girders on the top of each set of columns form a rectangle, two sides of which form the top tension members, while the other two act as braced struts. In the sloping plane of the columns diagonal tubes 8 ft. diameter are placed, which run from one side of the skewbacks to the top of the opposite vertical column. In the other or vertical plane the wind bracing and the supports for carrying the internal viaduct are placed. The viaduct extends unsupported from the one vertical plane to the other. Additional diagonal and longitudinal bracing girders, fixed in a horizontal plane at the crossings of the diagonal tubes, take up the various stresses at these points. These members may be said to complete a steel pier.

The Cantilevers.—Each of the cantilevers may be said to consist of two braced brackets, securely connected along their lower part by diagonal bracing, and fixed at various points. They approach each other as they recede from the pier, and batter towards one another as they approach the top. All members of each bracket lie in the same plane. The bottom or compression member of these brackets is built up of six straight bays, joined at an angle. As the bays near the point of the bracket they approach a horizontal position, till the last bay is actually horizontal. In section the first four bays are circular in form, in the fifth the shape gradually changes to the rectangular, and continues thus to the end of the sixth. The top or tension member is straight throughout, and, like the bottom member, divided into six bays, which are rectangular in form. The bracing in the brackets is of the double triangular type. The struts extend from the back of each bay in the bottom member to the front of the corresponding bay in the top member. The ties are the converse of this, the struts and ties, therefore, crossing each other. At the point of crossing a tie is fixed, which, extending to the bottom member, diminishes some stresses in that member due to dead weight. Between the struts box girder bracing is placed. Similar bracing is also fixed between the bottom members. Through these bracings the wind stresses of the cantilevers are transferred to the piers, and as this bracing, in conjunction with that between the struts, is utilized to transfer the wind stresses of the top member to the pier, no wind bracing between the top members is needed. The internal viaduct, insignificant in itself as compared with the cantilevers required for the carrying of it and its load, is supported by girders at the centre and ends of all the bays. After the cantilevers have been built two gaps, of 350 ft. each, will still remain. These will be closed up by a double parallel girder span. The girders will rest on the ends of the brackets, and lie towards one another with a batter similar to that in the piers.

The Skewbacks.—The skewbacks are the most complicated parts of the entire structure, the difficulties at this point arising out of the various angles at which the different parts lie in relation to one another and to the skewback. Each skewback may be looked upon as being either the starting point or the termination of five separate tubes and five distinct box girders. All these members are connected in such a manner to it as to transfer into or through the various parts of the skewback the stresses of each member. The skewbacks also act as the upper or sliding bed plates, on which some of the movements of the piers and cantilevers, due to expansion and contraction, take place. The sliding surface is the lowest course of several layers of steel plates, which form the base of the skewback. To the top of these plates a series of longitudinal girders are riveted, which are crossed at short intervals by one central and two smaller side diaphragms. Small stamped diaphragms are also placed between the longitudinal girders, immediately under the main ones. Between the centre and side diaphragms, and beyond the latter, are riveted four longitudinal lines of plates, and also a top plate, all of which merge into the horizontal and cantilever tubes at the opposite ends of the skewback. To the inner lines of the plates the sides of the two diagonal tubes are riveted. These also serve as part of the connection to the vertical column. Gusset plates and angles are principally used in effecting the connections of the girders to the skewbacks.

The construction of the parts of the structure subjected to compression is very different from that of the parts subjected to tension, hence the dissimilarity between the bottom and top members. The cross section of the larger tubes consist of ten plates and ten H beams, running longitudinally, and as the plates overlap one another in this direction, they form five outer and five inner courses. Butting each other on end, they are there connected by double covers. The H beams are placed immediately over the laps of the plates, and are secured by the rivets passing through the longitudinal seams. At intervals of 8 ft. stiffening circular diaphragms are introduced. In the smaller tubes, comprising the diagonal columns and struts of the cantilevers, the form is somewhat different, two flat sides being introduced to simplify the connections and crossings. These tubes consist of longitudinal plates and ties, varying in number with the size of the columns. The diameter of the largest tube adopted is 12 ft., while the thickness of the plates employed is in some cases as much as 1¼ in. In the cross section of the top members there are four booms, each consisting of ordinary flange and web plates, and in addition an extra horizontal web, for connecting the wind bracing. This, coupled with the vertical bracing, binds the whole into a stiff box form. The ties are similar to the top member in section, with the exception that there are no horizontal webs. In this case the horizontal wind bracing is secured to the flanges. The greater part of the wind bracing between the columns is of the same form as the ties, though in some cases it only consists of one angle iron at each corner of the box.

The internal viaduct consists of two main girders, with the necessary cross girders, bracings and roadway. The top booms of the main girders serve as troughs for two of the rails. The other rails are laid in troughs resting on the cross girders.

Erection of Steel Piers and Cantilevers.—As soon as the skewbacks were ready to receive them, the vertical columns and diagonal tubes were, by means of cranes, built up to a

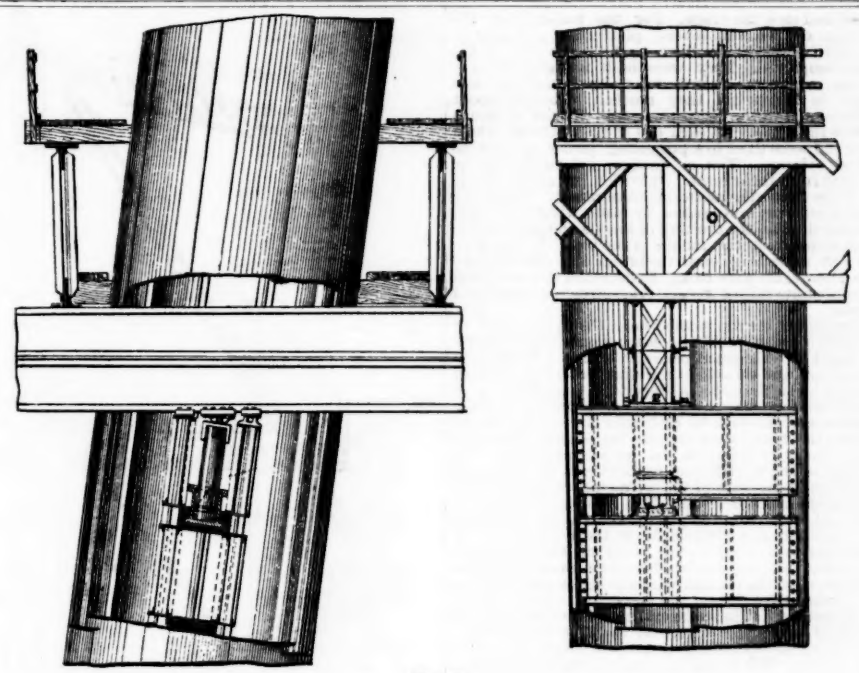


Fig. 3.

height of about 50 ft. Beyond that height rectangular platforms were built around the pier. The platform, weighing about 500 tons, was carried by the four vertical columns, and raised in stages of 16 ft. at a time, by means of hydraulic rams placed within them. After each lift the four vertical columns, the four diagonal tubes, and as much of the wind bracing as convenient or necessary, were constructed. The

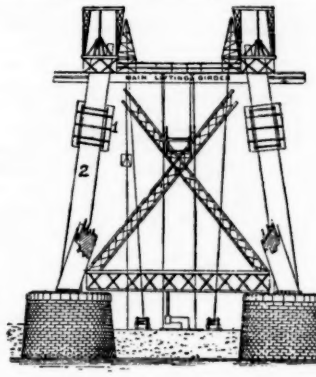


Fig. 1.

work proceeded thus until the full height was reached. The top of the vertical columns, and the top members between the columns, were then erected. After that the erection of the top members and the first ties of the cantilevers was commenced. While the top members of the pier were being built, the internal viaduct over the pier, and in the first section of the cantilevers, was raised in small portions into position. After the bottom members were carried out a distance of about 150 ft., and secured by temporary ties, platforms were built along their upper surface, and were afterward used for the erection of the ties at the centre of bay one, strut one. These platforms were raised until they almost reached the crossing of the first ties and struts. Meanwhile, the first ties were carried from the top down to and across the struts. After they were secured a new base was formed for continuing the internal viaduct, the bottom and the top members, and the struts and ties, with the necessary bracing.

Platforms and Lifting Plant.—The first portions of the bridge were erected by ordinary derrick cranes. Soon, however, the increasing height necessitated the use of platforms, on which cranes were placed. The platforms employed are of different kinds and vary greatly in size. The largest is that in use on the top of the Inchgarvie main pier, its dimensions being 350 ft. by 56 ft. In striking contrast to this is the smallest, popularly known as the "boatswain's chair." Between these two extremes the number and variety are almost innumerable. The platform with which the main piers were built surrounded in each case the entire pier. Those for the Fife and Queensferry sides of the river were similar in form and size, while that on Inchgarvie is larger and has extra bearing and lifting columns placed in its centre. The Fife and Queensferry platforms (figs. 1 and 2) consisted of two semi-independent platforms running parallel with the bridge, each surround-

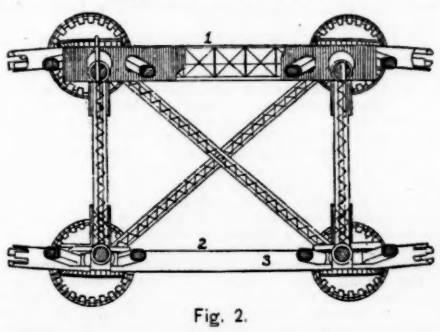


Fig. 2.

ing the two vertical columns and the two diagonal tubes on their respective sides. Each platform consisted of two parallel lattice girders, placed 18¼ ft. apart, with the necessary bracing, and covered with planking, well holes being left to allow the columns to pass through. These half platforms rested on sliding blocks, placed on two strong box-shaped main lifting girders, which lay across the bridge and passed through the vertical columns. On the top of these box girders gangways were laid. These main lifting girders were in turn carried by short cross girders (see fig. 3) within the vertical columns, pins passing through the girders and the permanent longitudinal H beams of the columns to take up the weight. Similar cross girders were in like manner secured underneath these, and carried the hydraulic rams used for lifting the platform. The plant used in connection with these platforms was of a varied description, and comprised hoists for raising the material, cranes for building the columns, rivet heating furnaces, the large machines for riveting the vertical columns, and numerous other articles. So soon as a length of 16 ft. had been added to the top of the columns above the platform, and one riveted underneath, the whole platform was raised another 16 ft. This was effected by means of the hydraulic rams already referred to. On water being admitted to the rams the weight of the main lifting girder was taken off the top cross girder, which allowed the pins to be withdrawn. This done, the main lifting girder and the cross girders were then raised 12 in. and the pins reinserted. One end of the platform now rested 1 ft. higher than before. The action of the rams was reversed, and the lower cross girders were then raised the same height as the upper. The other end of the platform was similarly raised and this alternate action was so continued till the full 16 ft. lift was accomplished. During the operation of lifting, the two semi-platforms were moved towards each other to prevent them coming in contact with the battering columns as they rose.

Before the pier reached its full height the bottom members

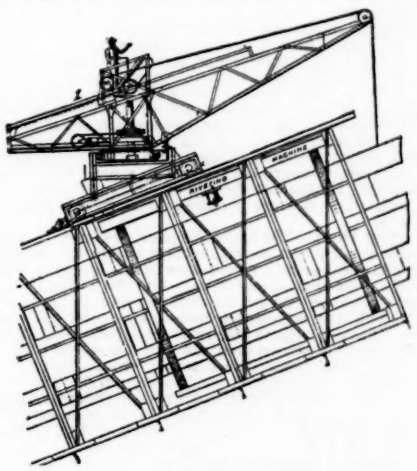


Fig. 4.

of the cantilevers were commenced. As in previous instances, the first lengths were built by ordinary steam cranes. Soon, however, other means had to adopted for carrying out the work. A cage (see fig. 4) carried by the tube was secured round each of the members. It projected beyond the outermost point of the tube, and served as a platform whereon the men worked. A hydraulic crane was employed to put the material in position. It traveled along the whole length of the top of the cage, and could be turned completely round by means of hydraulic gear, in addition to raising and lowering the load. The cage is rectangular in shape, and consists of duplicate sections in 8 ft. lengths, all of which are interchangeable. The case is held in position by struts and ties, which extend from its corners to rings encircling the tube. As the work advances the sections are transferred from the back to the front of the cage. The hydraulic crane (see fig. 4) used is of a peculiar design. It consists of two side traveling carriages, connected together by cross girders, on the latter of which are secured the connections necessary for carrying the jib and working the crane. The movements of the crane along the top of the cage are controlled by a ram on each of the side carriages. The raising of the load is effected by a single ram lying along the top of the jib. To the plunger of the ram a pulley is attached, and round it and the pulley on the jib point a rope is made to pass. This arrangement enables the load to be lifted a distance equal to twice the stroke of the ram. All the rams are made of wrought iron tubing, and castings are connected to the ends of the tubes for the fixtures and stuffing boxes. Steel wire ropes are employed to

lift the load and slew the crane. For the building of the first section of the cantilevers, platforms (see fig. 5) similar, though smaller, to those used in the case of the piers, were employed. They were built immediately over the bottom members, raised to a level position, and then lifted in stages till they reached a height about 200 ft. above high water. The raising was effected by means of hydraulic rams placed at each end of the platform. Those at the pier end were fixed to a projecting girder secured to the vertical columns. Ties, or hangers, extended down to the platforms from these rams. Provision was made for the removal of the ties as the platforms were raised. The outer ends of the platforms were raised by rams, within the ties, which extended from the crossing of tie one and strut one to the bottom members in the middle of the bay. To the main lifting girders, extending across the bridge and carrying the platforms, these rams were fixed. Underneath the rams, and also on the opposite side of the ties, cross girders were secured by steel pins.

In the erection of the top members and the upper parts of the cantilevers plant of peculiar construction has been adopted (figs. 6 and 7). The plant rests on the upper surface of the top members, and consists of a sliding framework of steel from which a large platform is suspended. On the top of this framework there are two cranes, one of which is actuated by steam and the other by hydraulic power. The former projects over the framework towards the point of the cantilever, while the latter points in an opposite direction. The principal part of the work is done by the steam crane, as it is employed to build the webs of the top members, and also the upper half of the ties and struts. The hydraulic crane, on the other hand, is employed in placing the flanges of the top member in position, and afterwards in the riveting of the same. The steel framework is composed of two main girders lying across the two top members, and several cross girders. It is level on the top and varies in depth and shape, so as to have a direct bearing on the respective sliding blocks fixed to the members. The steam crane is placed immediately over the top of the main girders, and has a jib 35 ft. long, capable of being slewed 115 degrees on each side of the centre line of the bridge. The hydraulic crane rests on a platform projecting from the main framing. This platform is 76 ft. long and 45 ft. wide, and is secured to the framework by braced angles. Its length is such that it almost extends as far as the points of the steam and hydraulic cranes, and in width is a little greater than the top members. It is made up of four longitudinal girders covered with timber, a hole in the front end being left for the material to pass through. When a length has been finished in front of the crane, the whole arrangement is moved forward to a position suitable for proceeding with the next length. The steam crane just referred to also places in position part of the material of the first ties and struts, and small stages are employed for work on these members. That for tie one (fig. 5) consists of a timber scaffold, suspended by wire ropes from a beam lying across the upper booms of the tie. As the tie is gradually built downwards the scaffold is lowered by tackle. The stage for strut one is a steel cage surrounding the tube, and having two timber platforms, which are placed at different heights. It is secured to the tube by brackets, fixed at intervals, and is lifted by the steam crane on the top members. This cage is required only for the top half of strut one, as the lower part has been already built from the platforms used in the erection of the first section of bay one. Flexible steel wire ropes have been used in the lifting plant with good results. Accidents which occurred when chains and Manilla ropes were employed, have now entirely disappeared. During the erection a large number of temporary ties and struts were employed for the purpose of keeping some of the members in position while unconnected, or enabling them to carry more temporary material. In the piers both the vertical columns and diagonal tubes had, at several points, to be kept apart by struts, while the diagonal tubes had also to be tied to each other before they reached the top. The bottom members are now supported by temporary ties, which extend to the vertical columns. In these diagonal ties the stress produced for each bottom member is about 500 tons. Although large platforms had been adopted in the beginning, smaller ones now take their place, as they are more easily managed. The reasons for employing these large platforms to build the piers were principally a regard to the safety and convenience of the men at work. They enabled them to handle a large quantity of material not only with speed, but attended with little danger to themselves. Large platforms are now not of the same value in the carrying out of the work, because cranes are already placed on the top of the bridge, which, without difficulty, can place material in position at a point 300 ft. below themselves. By the introduction of light scaffoldings only a few temporary ties are required to carry the permanent members.

Riveting Plant.—The hydraulic plant provided for closing as many as possible of the rivets in the bridge is, according to the work to be done, of a varied description. It may be divided into the following three types: 1st, the ordinary Arrol patent grab machine; 2d, direct acting riveters, using pressures up to 3 tons per square inch; 3d, special girder machines, for such work as the tubes and large flat surfaces. The first type mentioned does not call for special comment. The second type, or the direct acting riveters, using such a high pressure, is, however, we believe, novel. The riveter consists of a steel cylinder about 7 in. long, provided with a solid piston having a cup leather at the back end. Two cylinders are used together, one acting at the holder-on, while the other is employed to close the rivets. Into each cylinder a pipe is screwed, which provides for the ingress and egress of the water, and at this point also the exhaust is regulated. The high pressure water is controlled by a valve on the pressure pipe at a point further back, and from where a convenient connection can be led to both cylinders. These riveters were originally designed and employed for riveting up the longitudinal girders and diaphragms in the skewbacks. Some of the spaces in which they had to work were only 2 ft. 6 in. long by 15 in. high by 15 in. broad, and access to this small space was still further reduced at the top by a 4-in. angle all round. The method of application was to place one riveter on each side of the work. To each of these the water was led by a copper pipe from the regulating valve. A spring check valve was introduced into the pipe leading to the closing riveter, for the purpose of keeping back the water until the holding-on riveter had pushed the rivet home. When inserting a hot rivet the holding-on riveter was moved out of position. After being replaced, the water was turned on, when the riveter immediately pushed the rivet home, and held it firmly there. The other now came into play and formed the rivet head. Within the skewbacks it was no uncommon thing for a squad to close 100 rivets per day, shifting during that time all the copper pipes and connections from cell to cell as they moved along.

The heaviest rivets in the top connections of the vertical columns were almost all closed by these machines. In this case one of the riveters was used within the junction, while without an ordinary ram of about equal power was secured to a slide on a box girder. This girder, moreover, could be moved along the face of two other girders, thus giving the ram complete command over a large surface. The working pressure in this ram was 1,000 lbs. per square inch, and in the small cylinder 3 tons per square inch. With this combined machine 150 rivets, from 8 in. to 9 in. long, could be closed per day.

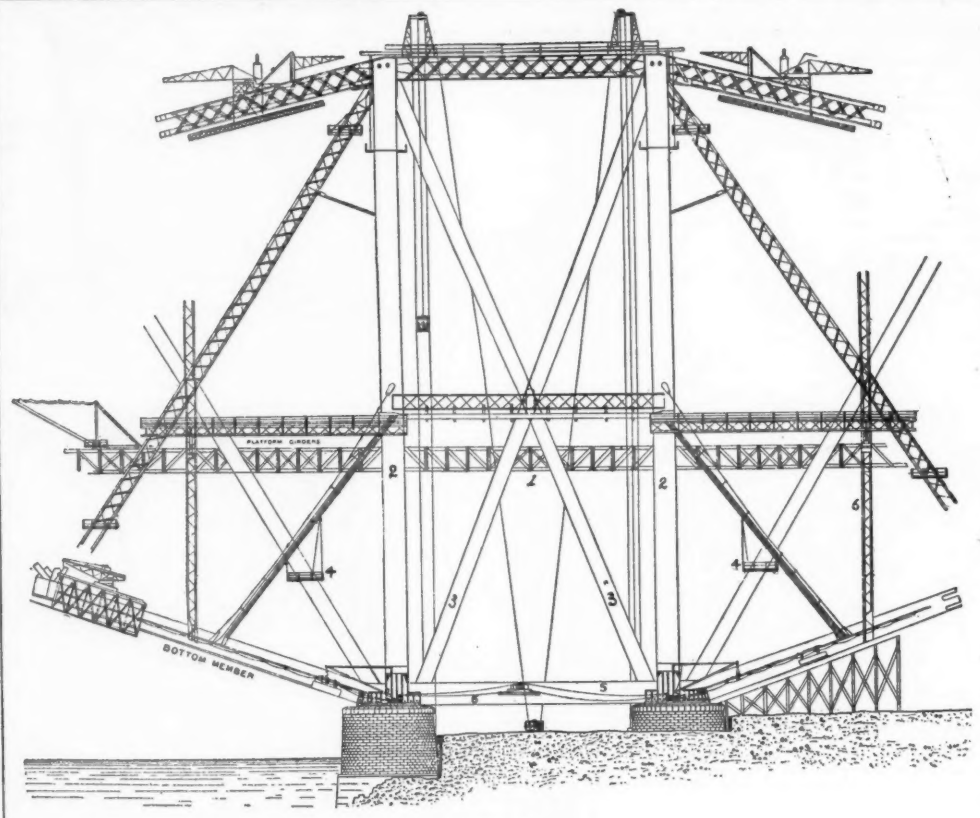


Fig. 5

1. Internal Viaduct. 2, 2. 12-ft. Columns. 3 3. 8-ft. Diagonal Tubes. 4, 4. Riveting Platforms. 5. 12-ft. Horizonta Tube. 6. Permanent Ti temporarily prolonged above the intersection. Tramway for material shown along centre line of bottom member.

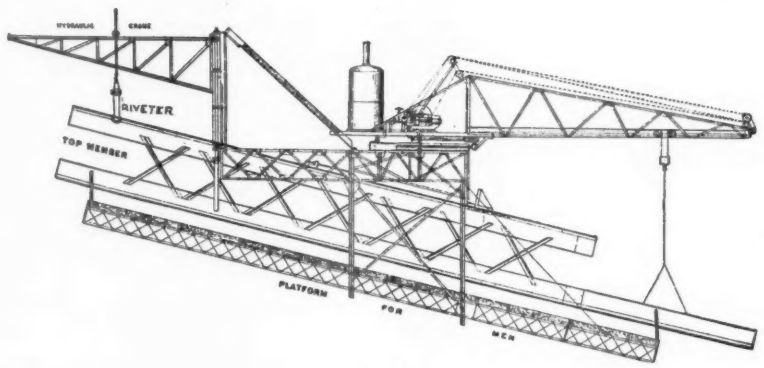


Fig. 6.

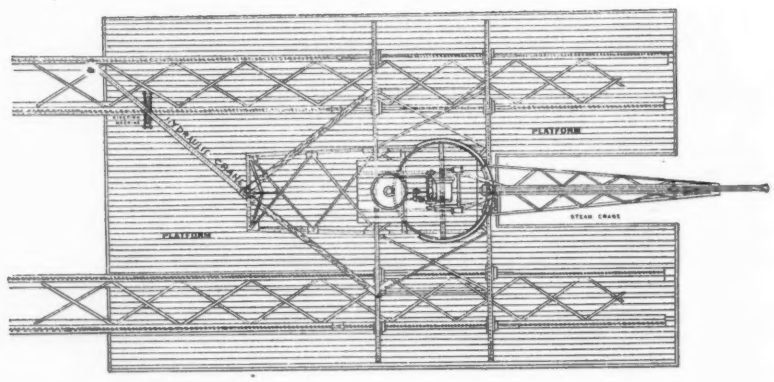
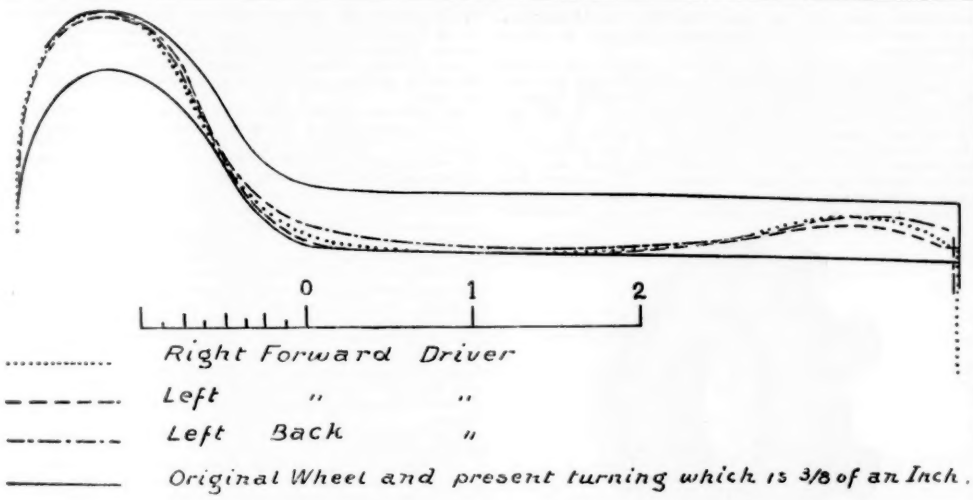


Fig. 7.

Before leaving the subject of high pressure riveters it may be interesting to consider the means adopted for raising the pressure of the water to almost 7,000 lbs. per square inch. The most efficient means to gain this end is a pressure multiplier. This machine was constructed almost entirely out of ordinary plant. The principle was to employ a large ram, with a small pressure, for exerting an increassed pressure by an attached small ram, the increase being proportional to the difference of the areas. This was effected by securing an 11 in. ram to the one end of a frame, while at the other end of the same frame a 4¼ in. cylinder was fixed. On the first ram a cylinder was placed, and attached to it was a small ram which acted as a plunger to the small cylinder. Water at a pressure of 1,000 lbs. per square inch was led into the cylinder on the large ram, and as this power was transmitted to the small ram it gave a correspondingly greater pressure on the small cylinder. As the large cylinder moved backward and forward, it reversed a small hydraulic slide valve which served to actuate the larger valve that regulated the water entering or leaving the low pressure ram. Besides this form of multiplier there are also portable ones. They are on the same principle as the large ones; but instead of being automatic in there action they are worked by hand. The high-pressure water pipes are made of wrought iron, and have flanges of the same material screwed and riveted on to their ends.

The third type of riveting machines employed is of an entirely new pattern. Here also two rams are used. If required for such work as riveting the circular tubes, one of the rams is supported on a longitudinal girder outside of the tubes, while the other is held by a girder inside. These rams move on slides, and are capable of being raised or lowered by a small hydraulic jack. On the outside girder a compound slide is arranged to facilitate the adjustment of the die; but on the inside girder other means serve the same end. The outer longitudinal girder is, by slides at the top and bottom, secured to ring girders encircling the tube, and is traversed round the former by hydraulic jacks. Within the tube, and opposite these ring girders, are two diaphragms carried on brackets fixed to the longitudinal H beams of the tube. Each diaphragm has a centre socket or step, within which the points of the inside longitudinal girder are free to revolve. By gearing commanded from the platform on which the men are at work, this revolving motion is imparted to the girder and through it to the ram. Working platforms are secured to both the outside and inside rams, and are raised or lowered along with them. The inside ram, being in most cases far removed from the rivet head, a special die has to be used. The machines when used for riveting the columns of the main pier were suspended from the platform



Wear of Driving Tires in Running 329,009 Miles.

ENGINE NO. 35, CUMBERLAND VALLEY RAILROAD.

and raised along with it. On the main pier 600 to 800 rivets were closed in a day with the machine just described.

Engineering, of April 27, says that it is anticipated that during the summer months 1,700 tons of steel work will be erected monthly and that the bridge will be finished in eighteen months.

Wear of Tires—Cumberland Valley.

The accompanying illustration represents the wear of the driving tires on an engine, No. 35, built for the Cumberland Valley by the Rogers Locomotive Works. The tires ran an unusually long mileage, 329,009 miles, before the tires were re-turned, and while the main facts were given in a recent issue,* some further particulars may be interesting.

The locomotive was of the American or eight-wheeled type, having four drivers coupled and a four-wheeled truck. The cylinders are 16 × 22, and the weight on the four drivers is 46,550 lbs. The driving tires when new were 63 in. diameter on tread and were made by the Midvale Steel Co. The maximum grades are 40 and 45 ft. per mile, going east and west respectively, and the sharpest curvature is 5 degrees, but most of the curves are not above 3 deg. or 1,910 ft. radius.

The sections show the wear of the two main drivers and of one rear driver only, the fourth tire having been returned before the templates were made.

The rail in use is the regular Pennsylvania Railroad pattern 60-lb. rail.

The loss of thickness of tire being $\frac{5}{8}$ in., the mileage per $\frac{1}{16}$ in. of wear is nearly 55,000 miles, or considerably in excess of the results usually obtained.

Torsional Testing Machine.

The cut shows a testing machine for torsional strains, built for the Union Pacific by Messrs. Riehle Brothers, proprietors of the Philadelphia Scale & Testing Machine Works.

The machine is made entirely of iron, steel and brass, and is made with the skill and care for which the product of this house is noted. The dimensions of the machine are as follows: Length, 3 ft. 4 in.; height, 4 ft. 9 in.; width, 24 in. It weighs about 1,200 lbs., and has a capacity of 5,000 lbs. It will test round or square specimens up to 20 in. in length.

One head is fixed longitudinally and connected to the weighing system; the other head is adjustable. The fixed head carries on either side an arm one foot long, with a knife edge, and these arms are connected by an equalizing lever passing under the head. By this arrangement the head has no tendency to lift from its position. The equalizing lever is connected to the weighing beam, which is graduated to indicate the strains in foot-pounds. The weighing lever and poise are carefully adjusted to the standard of the United States Government at Washington.

By shifting the movable head the apparatus is adjusted to specimens of different lengths. Both heads have self-centering grips. The shifting head has graduations to indicate the arc through which it turns.

The machine, as shown, is operated by hand, and there are two gearings to be used accordingly as more or less power is required. By a slight modification the apparatus can be worked by power from a belt.

The result of a test is at once apparent in foot-pounds on the weighing beam, and the pressure of the moving end of the bar is recorded by the graduated head and indicating figure.

For prices and further particulars apply to Messrs. Riehle Bros., Ninth street, above Master, Philadelphia, Pa.

Size of Axle for 60,000-lb. Car—Western Railway Club.

The May meeting of the Western Railway Club was held the 16th inst., and the discussion of the proper size of axle for a 60,000-lb. car was continued.

WILLIAM FORSYTHE (Chicago, Burlington & Quincy), not being able to be present, wrote as follows:

The club has already favored the present standard distance of 6 ft. 3 in. centre to centre of journal. The advantage of this is the use of worn axles in the present trucks. The disadvantage is the limited bearing surface which this distance secures, namely, about 26 sq. in., giving a pressure of about 275 lbs. per sq. in. for an ordinary 40,000-lb. car fully loaded. A 4×8 journal in a 60,000-lb. car gives a pressure of about 330 lbs. per sq. in. If lower journal pressures are required, then a longer axle will be required. The experience with the 4 × 8 journals seems to indicate that they have a sufficient bearing surface for the larger load, and a longer axle will not be required. The other point which will come up is that of a collarless axle, and the question will arise, how can this kind of a journal be used in the present M. C. B. box? The present M. C. B. axle is properly proportioned for scrap and ordinary iron axles, and a 60,000 axle, if made of the same material, should be enlarged at all points, so that the cubes of the diameters of the two axles shall be respectively as the loads on them.

GEORGE W. STEVENS (Lake Shore & Michigan Southern) wrote as follows: My belief is that the iron axle mapped out is perhaps sufficient for strength, but that the journal (8 in.) is not of sufficient surface to insure good lubrication. He also referred to the relative bearing surfaces of engine and tank truck journals.

Messrs. Barr, Samuel Pullman, Sinclair, C. B. Hickey, Cleaver, Rhodes, Bushnell, Snow, Cooke, Selby and Nichols participated in the discussion.

As a result, Mr. Pullman, Chicago Rock Island & Pacific, moved that the length of journal be 8¼ in. Mr. Sinclair amended, making it 8 in. instead, which was carried.

On motion of Mr. Hickey the diameter of journal was fixed at 4¼ in. On his motion also the finished diameter of dust guard bearing was made 5 in.

The other dimensions had been fixed at previous meeting of the club and it was deemed unnecessary to reconsider them.

The full dimensions, therefore, as recommended by the club for adoption by the annual meeting of the M. C. B. Association are as follows:

Scrap iron, total length, 6 ft. 11¼ in.; length between centres of journals, 6 ft. 3 in.; finished length of journal, 8 in.; finished length of dust guard bearing, 2½ in.; diameter of axles at centre, 4⅝ in.; finished diameter of wheel seat, 5¼ in.; finished diameter of dust guard bearing, 5 in.; finished diameter of journal, 4¼ in.

The secretary had sent out the following questions, asking responses from those unable to attend: 1st. Do you have any trouble from imperfect journals in car axles? 2d. What percentage is rejected, and what percentage of passenger car axles are found good for freight cars? 3d. What defects render an axle unfit for passenger car service, or cause it to be scrapped? 4th. Is there any difference found in the journals of scrap and muck bar axles?

THOMAS SUTHERLAND (Chicago & Grand Trunk) responded by letter as follows: 1st. No. 2d. All passenger axles are good for freight cars. I have no record where we have ever had to abandon one. Our rule is to use all axles under passenger cars three years, and then they must be taken out and put into freight car service. 3d. I cannot very well define your question. I should say a cut journal rendering the turning of it up under the proper size, or repeated heating or burning, would be a sufficient cause for taking a journal out of passenger service, and, perhaps, for scrapping it. 4. Would prefer muck bar; they are far less liable to defects. I find seams in scrap axles when turning them up many times, rendering them unfit for service, which, of course, is owing to imperfect welding. From July 1 to Dec. 31, 1887, we have had to remove from passenger cars, Chicago & Grand Trunk, two axles for cut journals and one for bent axles, during which time we have hauled 10,007 passenger cars. Freight cars, 15 cut journals, 2 axles worn out, 4 bent axles, 3 broken journals, 4 cracked axles, 2 burnt journals. Freight cars handled during the period, 200,783.

At the request of President Rhodes Mr. James McM. Smith, of the Straight Fibre Iron Co., explained to the club the process used in making rolled axles, showing how a uniform fibre may be secured in scrap axles. The scrap is rolled into inch bars, bundled and hammered.

President Rhodes read reports from Division Master Mechanics of the C., B. & Q. showing that about one per cent. of scrap axles were rejected.

Mr. BARR stated that he preferred the scrap axles to muck bar, his experience with the latter being unfavorable. The tenor of the answers to the questions may be summarized: 1st. No. 2d. A little less than 1 per cent. 3d. Small journals and collar wear. 4th. Scrap gives best journal.

A resolution by Mr. Hickey, instructing the Secretary to issue a circular to general managers of railroads, impressing the necessity of encouraging their officials to attend club meetings in the interest of progress, was unanimously adopted.

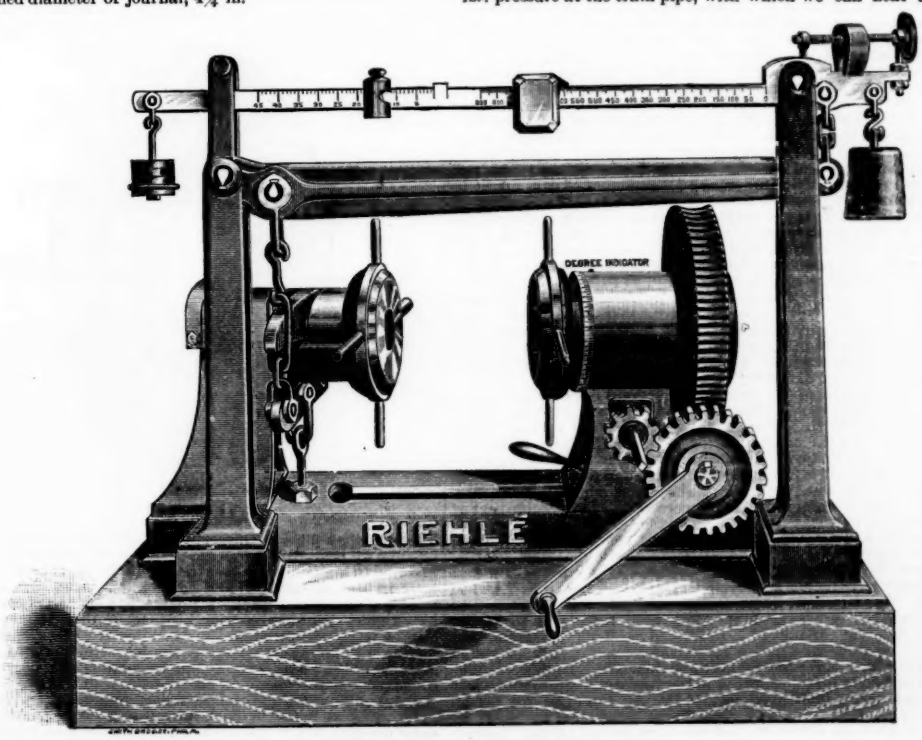
Adjournment was then taken until the third Wednesday in September.

Steam Heating of Passenger Cars.

At the regular meeting of the New England Railroad Club, May 9, 1888, the discussion of the subject of steam heating was continued. The President announced that under the subdivision of the question agreed upon at the last meeting, the fourth clause of the question was now in order, viz: Main pipes and other pipes and valves connecting therewith.

Mr. PENNYCUICK stated that the main pipe ought to be at least 1 or 1¼ in. in diameter.

Mr. CHASE (Williames system): We have tried a 2-in. pipe, also 1½-in. pipe, and got very satisfactory results from the latter, having in the car a heating surface of 240 ft. We have also used a 4-in. pipe, to which there are some objections, and obtained the same result with it by using 86 sq. ft on one side of the car that we did with a 1½-in. pipe using 120 sq. ft. on one side of the car. The advantages of the larger pipe over the smaller one are: Ability to heat more quickly, ample opportunity for expansion and the securing of good drainage. I believe in a large train pipe, in large, open, straight connections, large radiating pipe and large surface, and then we have no trouble in heating six cars, using direct steam from the boiler, with not over 2½ lbs. pressure at the train pipe, with which we can heat the



TORSIONAL TESTING MACHINE.

Made by MESSRS. RIEHLE BROTHERS, *Philadelphia, Pa.*

*See *Railroad Gazette*, page 289, May 4, 1888.

cars to 100° temperature. We have been heating 12 and 15 cars in the coldest weather with not over 15 lbs. pressure in any part of the train pipe, using large, straight pipes and ample surface of heating pipe.

Mr. MARTIN (Martin system): In my experience with steam heating, I have found that by enlarging the pipe we are enabled to reduce the pressure of the boiler. But it is impracticable to put a 2 or 3 in. pipe under a car, and we have found, in an experience with 800 to 900 cars, that we have been able to transmit the steam to the last car with a 1¼-in. pipe. I was surprised at the statement made at the last meeting that it was necessary to carry a pressure of 40 lbs. in the main pipe to heat 4 or 6 cars. It is not necessary to carry such a pressure as that to accomplish the work, nor to extend the size of the main pipe. With a large main pipe you increase the chance of condensation; the larger your pipe the more surface is exposed to the atmosphere and the more it is affected by the temperature outside. The smaller the main pipe to accomplish the result at a low pressure the better. The pipe should be large enough to permit the water to run off by gravity and not be pushed by the steam, and then you get the benefit of low pressure. By keeping your pipe straight, having enough steam to pass through without creating friction, letting the water run off by gravity, the steam passing over it, you will accomplish the best results, without reference to the exact method.

The question has been asked what I should consider the normal pressure, with an inch and a half pipe, to heat six cars. That would depend upon the temperature. To heat the cars quickly, you must, of course, put on considerable pressure; but after the cars are warmed, 10 lbs. pressure from the engine will suffice to keep them so, and the circulation and the water will be taken care of at that pressure.

The PRESIDENT: The next branch of the subject is, the use of live steam, exhaust steam and water for heating purposes. I suppose that means the relative merits of these different methods of heating.

Mr. PENNYCUICK read a paper of which the following is an abstract: I desire to say a few words on this question of the continuous heating of cars by steam, particularly regarding my own system, not only for passenger cars, but to show its perfect economy for freight cars for the transport of perishable products.

The various and rather reasonable objections of railroad officials to the use of a separate source of heat from that of the locomotive, combined with the very questionable sanitary condition of railroad cars as they had been hitherto heated, induced me, several years ago, to consider the question in two lights; first, as a sanitary measure, and second, as to economizing the power of the locomotive. By most of the systems in existence I think it will be found that both these points have been almost if not entirely, overlooked. In a sanitary point of view, without thorough ventilation, pure steam heat or stoves, even the Johnston or Baker heaters are to be avoided, while steam heat from a running locomotive is far too intermittent in temperature for either health or comfort—the temperature varying according to circum-

Fig. 1.

stances, from freezing to roasting. As to the economy of the power of the locomotive, that is a point which has never been considered by those systems which profess to heat satisfactorily ten or twelve cars without injury to the motive power that draws the train. I make an exception in the case of the Williames system, which has a distinct character of itself.

In view of the heating of cars in the manner described, I inferred that what was wanted was a system in which, while affording ample and healthy heat, of which the locomotive would be the main source, the great essential of speed should not be entrenched upon to any serious extent, that there should be some simple and not dangerous auxiliary to keep up that supply of heat during the disconnection from the primary source, and that the system must be, as much as possible, automatic. Where human handling was requisite, it should be as simple as the absence of mechanism could make it. It should easily control the speedy raising of the temperature, and also its gradual lowering, and last and most essential, that any reasonable number of cars might be comfortably heated within a few minutes of the coupling of the locomotive to the train. All these essentials to a simple and economic system of car heating I considered in their order, taking the last first, having already found that a hot water circulation was far ahead of pure steam, for health, security, and particularly economy, as I shall show by some figures I have prepared. I will admit that a given quantity of steam pipe will give off more heat than a hot water pipe, but in the relative permanence of temperature between the two systems a most remarkable difference is shown in favor of the hot water pipes, not to mention the immediate sanitary advantages of the latter.

The weight of steam at 212 degrees as compared with water at the same temperature is about as 1 to 1600, so that a pipe filled with water at that temperature contains over 1,600 times as much matter as a similar pipe filled with steam at the same temperature; and when the latent heat has been abstracted from the steam pipe, and the steam has condensed into water, it will contain just as much heat as a similar bulk of water at a like temperature. The specific heat of steam with water for equal weights is as .8470, or say five-sixths, to 1. But the latent heat of steam being estimated variously from 900 to 1,000 degrees, we find the relative heat obtainable from *equal weights* of condensed steam and water in reducing both from 212 to 60 degrees is as 7.425 to 1. But for *equal bulks* water will give out 225 times as much heat as steam on reducing both from 212 to 60 degrees. Or, to put it plainer, a given bulk of steam will lose as much heat in one minute as a similar bulk of water will lose in three hours and three-quarters. In this calculation I have simply referred to the water and steam alone, not considering what enveloped them. As iron pipes are generally used, and that metal being nearly the same as water in specific heat, it follows that we have an additional heating body in the pipe itself, besides the water in the boiler, which continues to give off heat until the two ends of the system balance in temperature, so that in actual practice, beyond scientific data, I find that it takes some four hours to cool a hot water system of 1¼-in. pipe from 212 to 60 degrees, while under the same circumstances a steam pipe is cold in half an hour.

Returning to my considerations of a simple and perfect car heating system, and determining on hot water as a medium, I next proved the practicability of carrying steam a long distance without very much material loss. I did this by carrying exhaust steam through half a mile of ½-inch pipe, and boiled a bucket of water inside of ten minutes. I have since been told that a similar test was made and like results obtained at a greater distance. This proved that under judicious arrangements herein lay a means for heating as many as 20 cars simultaneously from the locomotive

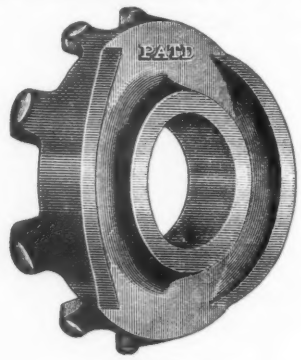


Fig. 2.

within a few minutes, and without impairing its power to any material extent.

It remains for me now to say that I have at the request of one of our leading railroads fitted up an apparatus. It has been inspected, tested and approved by leading practical men, who freely admit that old-time theories are not always to be depended upon. Our apparatus consists of over 250 ft. of 1¼-in. pipe, uniting a circulating hot water system in a very small boiler, without any mechanism beyond a very small valve, with no condensation or any other traps, there being no need for them. We provide very simply against the danger of freezing, and also for the keeping up the circulation in the absence of a locomotive. We have got all we think essential, in a simple, safe, efficient and economical heating system for either passenger or freight cars. Our system has been examined by order of the Railroad Commissioners of the state and reported on.

I will conclude by quoting the average figures of the two systems, that is, all steam heat and our own, which is steam and water:

Time occupied in heating cars to 67 degrees, by other systems, 1 hour 23 minutes; by ours, 16 minutes. Steam used during this operation by other systems, 96.5 lbs.; by ours, 52 lbs. Steam used while the train is running, per hour, by other systems, 79 lbs.; by ours, 6 lbs. Steam pressure used by other systems, 40 lbs.; by ours, 10 lbs.

We made this test in a large room, under similar conditions to a test made upon the cars, similar conditions of temperature, and everything was considered.

Mr. SEWALL: I will state a few of the advantages of steam over water as concisely as possible. Among others, steam is more easily and readily sent through radiating pipes than water, it imparts more heat than water, and is more quickly brought under control. Take, for instance, these cool mornings and warm days, the water circulation heat extends too far into the day and makes the car uncomfortable; whereas by the use of steam, just enough can be admitted to render the temperature what is desired, and it can be cut off when not needed, or held in control. With regard to the size of pipe, I think it has been pretty well demonstrated by some of our leading railroads during the past winter that a larger pipe will do better than a small one.

Mr. MARTIN: It is easier to control steam than water, and to change the temperature. We propose with our system the next year, to present to the railroads something to hold the temperature at 65 or 70 or 80, automatically, just where it is wanted. I think that with that arrangement it can be kept more uniform with steam than with water, provided you can get the steam.

Mr. CHASE: There is one other point that has not been touched upon, which I think is going to be considered a vital point as we get more acquainted with steam heating.

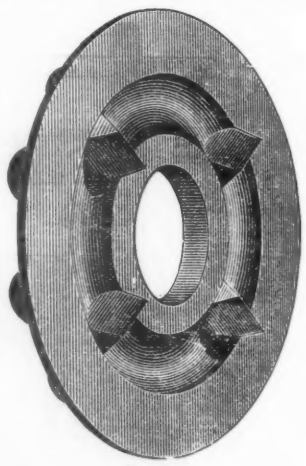


Fig. 3.

The principal purpose hitherto has been to prove that it is possible to heat cars by steam from the locomotive. The question of economy has not been much considered. I believe in heating cars well and economically, and one of the principal advantages of the Williames system is to be able to use exhaust steam and get the heat out of that, without creating a back pressure. It has been one of the points to be proven by this system during the last winter that we can acceptably heat cars, even to an uncomfortable degree, by using the exhaust steam of the Westinghouse brake pump, without any live steam from the boiler, by means of a vacuum pump; and we make no back pressure upon the pump, because the exhaust into the smoke stack is entirely unobstructed, and we get more than sufficient heat to heat six cars. I think that in the future the economy of the work will be considered more than now. I claim to be able to heat cars for nothing, as far as the cost of the steam is concerned. After we have fully proved that railroad cars can be heated by steam from the locomotive, then the question of exhaust steam, and the economy of returning the water after using to the boiler to increase the temperature of the feed water in the boiler, will be considered of more consequence than they are now.

Mr. SEWALL (Sewall system): The amount of pressure received in any method of taking exhaust steam must necessarily be intermittent and varying in using it from the Westinghouse pump; and the exhaust from the locomotive proper is also constantly varying, and in experiments it has been found necessary to use live steam when it fell below a certain point. There is another objection to the use of exhaust steam; it transmits into the valves and pipes, and everything connected with the circulation, more or less of the oil used in the cylinder, which in time coats the pipes, and renders their radiation imperfect. We have found that a great obstacle in the use of exhaust steam. In heating a building you always have a given number of lineal feet of pipe; but in a train these lineal feet are constantly changing; the conditions are changing. The experiments I have made led me to abandon the use of exhaust steam, and to use direct in its place; and I have found, in meeting all circumstances and conditions, when the engine was alive she was fully able to meet the requirements without loss of power for her other duties.

The PRESIDENT: The next question is the auxiliary boiler under the cars.

Mr. SEWALL: We have, in connection with our system, an auxiliary boiler that receives all the water of condensation. The operation is such that one valve closes the ends of the pipe, so to speak, so that a fire being started in the auxiliary boiler, a perfect circuit is made, and steam generated there, which passes up through the circulating pipes within the car, returning the condensation in the boiler. The loss of steam is imperceptible. We have run it continuously 48 hours without apparent loss of water. It is calculated to do just the work called for, heating each individual car, and at no time can a pressure be obtained greater than 10 lbs. to the square inch. There is in connection with this another combination of valves to open or close. The drip also goes into that water from the radiating pipes, where it is then trapped out by automatic traps. After the train has been run to a proper distance, and sufficient condensation caught, it is ready for use. If sufficient water has not been caught, there are other means for filling the boiler to the necessary amount. This boiler is applicable to terminal points, junction points, and other places where no steam plant exists, or steam from any other source is obtainable for the heating of cars before starting.

The club adopted a new constitution and by-laws, and adjourned to the second Wednesday in September.

The Eclipse Washer.

The cuts herewith show various forms of a lock washer made of malleable iron and adapted to different purposes in

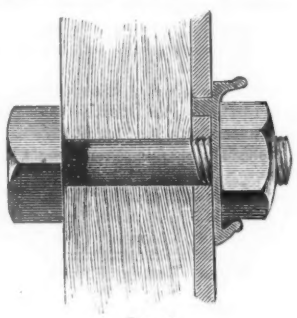


Fig. 4.

railroad work. It will be seen that the design is to lock the nut by bending down one or more of the lugs projecting on the face of the washer. Figs. 1 and 2 are front and back views of a washer made to use with a fish plate which has a concave channel along the centre line. The fish-plate washer is made also without the flanges here shown on the inside face, but with a lug to fit in an oval bolt hole and so keep the washer from turning. It is said that these washers can be repeatedly used, as but one or two lugs are bent down at one time.

Figure 3 shows the back of a washer designed for bridge guard-rails and car trucks. The sharp lugs shown are forced into the wood. This washer has a large bearing and the locking lugs are placed on the face on a circle considerably smaller than the circumference of the washer. In fig. 4 is shown a washer with a stud engaging in a hole in a piece of metal, which is found useful in some situations. These washers are now in considerable use, and are made by the Troy Malleable Iron Co. for the Eclipse Nut-Locking Washer Co. of Troy.

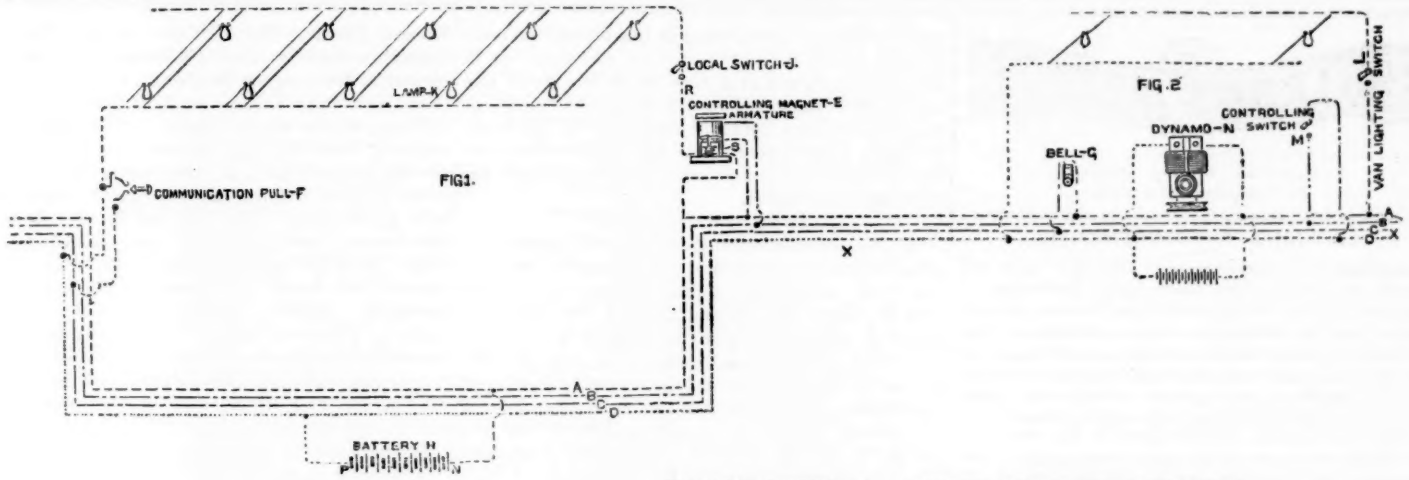
Lighting Trains by Electricity.

A train has been running for some months between Derby and Manchester on the Midland, of England, which is fitted with electric lighting apparatus, according to plans devised by Mr. Illius A. Timmis, C. E., of Westminster. For the illustrations herewith and the main facts of the description we are indebted to the *Engineer*. The system possesses several new features, which will be of interest to American readers. The apparatus was designed to fulfill the following requirements, which Mr. Timmis believes are essential to the successful lighting of trains by electricity:

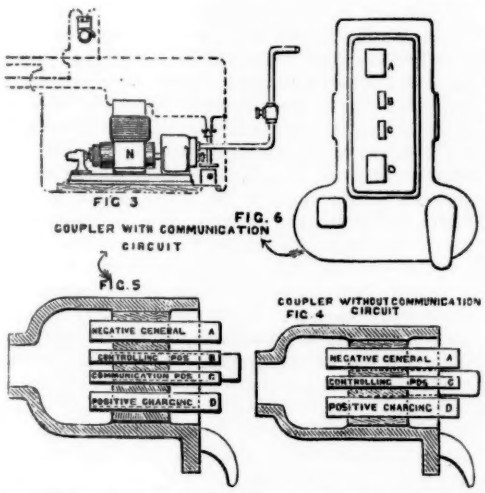
1st. Each car must be equipped with lighting apparatus, so as to be independent of every other, and capable of being lighted when disconnected from the train, should that be desired.

2d. The arrangements must be such that all the lamps in train can be lighted and extintinguished from one point when necessary.

3d. On the train breaking apart or a car being set on a siding, the lamps must remain lighted if they are already so, or if not must light automatically. The importance of this last will not be so apparent to American readers as it seems to be to Mr. Timmis. Tunnels are very numerous in



TIMMIS'S SYSTEM OF LIGHTING TRAINS BY ELECTRICITY.



England and trains have been known to break apart just after leaving a tunnel, and the rear portion run back into the tunnel; but a special provision of this kind at the present day, when breaking of trains is so infrequent, would seem to be of comparatively little account. Mr. Timmis also includes in his scheme electric communication from the different parts of the train to the conductor's van.

The essential principles of this system, which will be readily understood from the diagrams, are a dynamo machine in the baggage car (or on the locomotive if desired) driven by a small independent engine, taking its steam from the locomotive, or by connection to one of the axles of the train; a number of accumulators under or on each car (these are sufficient to supply the lamps in that car during the longest time they might be required when the engine was detached from the train, and the dynamo could not be run); an arrangement of circuits such that each car can be lighted or extinguished independently of every other, while at the same time all the lamps can be simultaneously lighted or put out by the attendant in charge; means for signaling to the conductor; and, lastly, devices for automatically lighting each car, should it be accidentally detached from the remainder of the train. The following is a brief description of the apparatus and the manner of its use: Four main wires run through or under each car, marked *A*, *B*, *C*, *D* in the figures; these are united between the cars by couplings, fig. 4 and fig. 5. The dynamo and the batteries and lamp circuit in each car are joined up in parallel to two of the wires *A* and *D*, as shown. By this arrangement, if the dynamo produces more current than the lamps require, it goes to charge the accumulators; if less, the balance is supplied by them. When the lamps are not needed the dynamo can be used to charge the accumulators, should they be not already full.

The train being ready to start, the attendant goes through the cars and by means of the switch *J* in each car lights the lamps, and thus assures himself that the apparatus is in good order. He then closes switch *M* in the baggage car. This sends a portion of the current from the wire *D* through switch *M* to *B*, thence through an electro-magnet *E* in each car (which by the attraction of its armature breaks the circuit of the lamps and extinguishes them in that car), and by the wire *A* back to the dynamo; while the remainder goes through the accumulators and thence returns by the wire *A*. When passing through a tunnel or whenever the lights may be needed, the attendant opens switch *M*, which interrupts the circuit through the electro-magnets *E*, and the lamps are then alight through the whole train; when the tunnel is passed, closing the switch *M* extinguishes them. If the train breaks apart, the circuit through *E* is interrupted in the detached portion, and the lamps are automatically lighted by current supplied from the accumulators *H* in each car. Signals are given to the baggage car when required, by means of the switch or push button *F*, which sends a current through a bell *G*. If necessary the accumulators can be charged from a dynamo at a terminus of the road. The "Union" accumulator was chosen for this work because it is somewhat lighter than the others for the same capacity.

An approximate estimate by Mr. Timmis of the expense of lighting by this method, not including cost of plant, or losses of any kind, is as follows:

A train requiring say 122 lamps would use probably 4,200 watts, or 4,200 ÷ 746 = 5.6 electrical H. P. If the boiler evaporates 7 lbs. of water per lb. of coal, and the steam be used at 140 lbs. pressure, this amount of power would increase the average consumption of coal about ½ lb. per mile run. The power required to run the dynamo from an axle is practically the same. Whether or not Mr. Timmis' scheme be a practically perfect one for lighting a railway train, his idea is certainly ingenious, and deserves careful consideration.

A few experiments with a dynamo on a train, supplemented by accumulators, have been made in this country. Trains have been running for some months on the Pennsylvania's "Florida Express" from New York to Jacksonville, which are so equipped, the engine being supplied with steam from the locomotive. A similar experiment has also been going on for a year or so on the Connecticut River road, the train being fitted up according to plans of Mr. S. H. Barrett. In the latter case, the engine—a kind of rotary engine of Mr. Barrett's own design—is in a closet in the baggage car, and 24 Julien accumulators are in the rear car of the train. During the daytime, the dynamo is run a part of the time to charge the accumulators, but it lights the lamps at night except for one or two return trips from Northampton to Springfield, when the locomotive is at the opposite end of the train, and the light is furnished from the accumulators. Should the train break apart when the lamps are lighted, or cars not furnished with electric lights be interpolated in the train, the rear portion, which would be cut off from the dynamo, would be supplied from the accumulators. There are about ten lamps in each car, or about 50 on the train. Mr. Barrett says there have been no repairs, and the running expenses are only for the steam consumed. The dynamo he has in use can light 7 cars, and six are used during the busy part of the day.

The plan of combining an engine and dynamo in the baggage car with accumulators in the same car or in all the cars as a reserve, seems to meet with considerable favor at the present time, and a number of experiments of this sort are in contemplation by various parties interested, who are very sanguine of practical success. The accumulators are necessary, not only as a reserve for the lighting when the dynamo is not running, but to steady the current of the dynamo. A perfectly uniform speed cannot be obtained under the usual conditions, and the current is therefore variable, which would cause disagreeable fluctuations of the light, were it not for the accumulators, which absorb or equalize the variations, so that the light is perfectly steady. When properly adapted to the existing conditions, no regulator for a steam engine is so sensitive or prompt in its action. The result of these experiments will be awaited with interest.

The Brooklyn Bridge Terminals.

At a meeting of the Bridge Trustees, held May 14, a resolution was introduced to reconsider the recent action of the Board in rejecting the circulating plan recommended by the Board of Exports, and adopting a modification of the tail switching system shown in our issue of April 27. This resolution was laid on the table by a vote of 12 to 1. In discussing the resolution Mr. T. C. Clarke made the following remarks:

This Board is asked to reconsider its action at its last meeting by which it adopted certain terminal plans. If this can be shown to be for the public good, I shall vote for it. At present I can see no reason for questioning the wisdom of the action taken on the 17th day of last April.

It has been publicly stated that the estimates of our Chief Engineer were falsifications of fact, and were intended to deceive this Board by exaggerating the cost of a certain patented plan in order to prevent its adoption; the inference being that if this gross charge were true, we should hasten to reconsider our action, and adopt that rejected plan, because it is the best that can be devised. Moreover, in order to strengthen this position I, as an expert member of the late Terminal Committee, am misrepresented as saying that I am in favor of this patented circulatory 18-car plan, with its manifest absurdities and dangers. I deny this. I look upon it with the utmost distrust. What I did say, and do now repeat, is that I am in favor of *a* circulating system which will do away with locomotives. So far I agree with the late Board of Experts. What that circulating system is, I will explain later.

The rejected patented system is most dangerous, for the reasons given by our Chief Engineer, in his letter of April 10. Can anything be more dangerous than to have a train of 18 cars, full of passengers, running down a grade of 170 ft. per mile with another similar train standing only 352 ft. in front of it? Should the grips fail to let go, or the brakes fail to work, the heavy 18-car train standing on the main track could not be got out of the way in time to prevent a disaster too shocking to contemplate.

This Board, I am proud to say, has always placed safety in working as the first, the last and the only consideration, and the results so far have confirmed the wisdom of this action. I for one do not intend to leave the path of safety.

About a year ago, when it became evident that means would be taken to increase traffic facilities, a plan was presented to you by an engineer of the highest standing, Mr. C. E. Emery. Mr. Emery proposed to lay two distinct sets of rails all over the bridge, which at the end stations should diverge into two parallel tracks with platforms between. So far this plan was entirely safe, but he also proposed to take the trains out in face of crossing and incoming trains. This was undeniably dangerous, and therefore his plan was not adopted. Mr. Emery, however, is a gentleman, and did not think it necessary to accuse the Chief Engineer and this Board of ignorance, incompetency and fraud because they did not adopt his plans.

The plan adopted by you at the last meeting is like Emery's so far as bringing in the trains. To take them to the outbound track it continues the long-used and safe practice of tail-switching. It is absolutely safe No full trains cross each other, and if an incoming train runs away there is always an empty track for it to run upon.

What future improvement can be made in this? Not to make it safer, for this cannot be done. But instead of switching the trains by locomotives, which are very expensive and noisy, it is possible to bring the trains around curves in the rear of the platforms, all as shown in blue prints Nos. 4 and 9 at the end of the pamphlet on terminals. This can be done by auxiliary cables. By this double system a capacity greater than that claimed for the rejected patent system can be attained.

You will ask why was not this system recommended for adoption by the Terminal Committee? It is the circulating system that we approve of. It is absolutely safe; it gives the greatest possible number of cars per hour, and it does away with locomotives. The answer is its enormous cost, chiefly owing to the great amount of new land required. Here you have a complete answer to the attacks upon us of exaggeration and falsification. Why should we wish to exaggerate the cost of a system that we would like to adopt. The charge is as absurd as it is scandalous.

We said in the Report of April 17: "In this age of inventions there is no knowing what the next seven years will produce." What we had in mind was, that the same ingenuity which has enabled trains of five cars to go around curves of 90 ft. radius on the elevated roads, instead of 240 ft. radius, the least previously known, may be trusted in the future to devise methods of modifying our cars, their tracks and wheels, and possibly the curved rails, so as to enable them to run around curves of much less than 90 ft. radius. If this can be done, the way to future enlargement is clear.

Take out the rear switching track and connect the platform tracks by curves of as small radius as possible, which will require comparatively little more land and station space. Until this can be done go on and use the system you have approved of and adopted.

For these reasons I shall vote not to reconsider the resolution adopted at our last meeting.

TECHNICAL.

Steel Ties in Mexico.

The Mexican Railway has recently received 80,000 steel ties, equal to 44 miles of track. Before the middle of June it is expected to complete the laying of these ties between Vera Cruz and Paso del Macho, and, after the rainy season has ended, to go on with the work on other sections of the road. Some 50 miles are already laid with steel ties.

Bull's Metal.

A new alloy containing copper, zinc, and some other metals, which at present are the secret of the inventor, has just been introduced in England. The metal is at present prepared in two varieties. One is a soft variety which is more adapted for cold working, and which has a tensile resistance of nearly 70,000 lbs.; the other is a strong variety, with a tensile resistance of about 75,000 lbs.; but this alloy is not so well adapted for cold working. *Industries* states that both varieties can, however, be forged and stamped at a dull red heat, the same as wrought iron. In the diagrams which have been prepared from tests made by Messrs. J. Buckton & Co., of Leeds, the strong metal exhibits a very peculiar property. Shortly after the elastic limit has been passed, which happens with a load of 24 tons, there is a sudden drop in the curve, but on further straining the metal it seems to recover itself, and there is as sudden a rise, so that finally the curve passes on as if this period of unstable equilibrium had not existed. Certain qualities of mild steel exhibit a similar property, but in not so marked a degree as in this metal. At the tests referred to, the hot rolled sample bar of the strong metal broke at 77,863 lbs., with an elongation of 19.3 per cent., whilst the soft metal showed 68,230 lbs. tensile resistance, with an elongation of 30 per cent. Test pieces of Bull's metal made from a round bar at a dark red heat are said to leave nothing to be desired as regards finish. The inventor states that the metal can be cast like gun metal, in dry molds. The chief precautions to be observed are to use a large head, stir up and skim well, and pour quickly.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The course of trunk line rates in the past week has been marked by two incidents of great importance. The first was the sudden and radical reduction in live stock rates; the second was the general reduction in west-bound rates to lake points. The people who know anything about the matter are reticent, and at this stage of the proceedings they ought to be. Some of the explanations given are obviously wrong. The statement that the trunk lines would be glad to leave the Grand Trunk the whole dressed beef business rather than do it at present rates is probably not true; and even if it were, it does not explain the reduction of the live stock rate to 25 cents. We believe the state of affairs to be somewhat as follows: The relations between the railroads and the dressed beef men have been somewhat strained for a long time. Since the cuts last fall, this trouble has been specially felt. In all semi-hostile dealings, the dressed beef men have the advantage of close organization; and they have been able to act in concert, while the pooling clause of the Inter-state Commerce act prevented the railroads from meeting them on equal terms in this respect. On the other hand, the relations between the railroads and the cattle men have been better, and organized differences have not broken out. This being the case, when the Grand Trunk has made its low dressed beef rate, the other roads have every motive to make their fight against the dressed beef men rather than the Grand Trunk. If they simply meet the cut, they may hurt the Grand Trunk, but they help the dressed beef men. If they cut live stock rates, they attack the real enemy at his weakest point. We cannot say what are the chances of success. The railroad men have all along claimed that the economy in shipping dressed beef was overestimated; that really, instead of obstructing an improvement by an artificial system of charges, they had put their rates at the relative figures which good railroad economy demands. This the dressed beef men have denied. We may now have the chance to see the question brought to a practical issue. If the economy of the process more than offsets the special cost of transportation, the dressed beef men and the Grand Trunk ought to win. If not, then the associated roads have an advantage. If the conflict continues long enough, it will go far toward showing which side was right in the question of economy, unless, as is often the case, the truth lies midway between the opposing claims.

It is somewhat significant that the first general reduction affects west-bound rates instead of east-bound. It is an illustration of those changes in the character of trunk line traffic in the last few years to which we make allusion in another column. Until very recently, a rate war was quite generally connected with a fight between cities for percentages of the grain export trade. To-day this has relatively much less importance. The particular cut in question has been forced by the pressure of water competition. It is a perfectly natural thing at this season; but coming as it does in connection with an unnatural cut in live stock rates, and at a time when the trunk line association is hampered by the Inter-state Commerce law,* and not very cordially supported by all of its members, it gives rise to some just apprehension and may precipitate a conflict which is likely to come before long in any event.

The New York Produce Exchange has published a protest against the action of the railroads in connection with export business; denouncing them for all sorts of illegal actions, and complaining especially that they carry export grain at a share of the through rate which is lower than the charge on grain destined for use at home. As far as the sweeping charges of illegal action are true, we trust that the practices will be stopped as soon as possible; but as for the particular matter which is complained of—special export rates—we believe it to be a justifiable system. We are aware that the Commission has recently taken ground against it, especially in unofficial utterances—but their attitude on this matter has been so unsteady, that we do not believe their present state of mind to be necessarily final. Export rates on certain goods have been lower than domestic rates in all countries and at all times. Special export rates exist to-day on the state-owned railroads of continental Europe. In England the first railroad charter contained a provision to the effect that rates on export coal *must* be less than was allowed on coal destined for home consumption. The reason for this is not far to seek. In order to be able to put a commodity on the market, an aggregate transportation rate must be made which shall not exceed the difference between cost of production at the initial point and market price at the destination. If that has to be divided between a railroad and an ocean steamer, it leaves very little for the railroad. They cannot reduce domestic rates to that level without financial ruin; they cannot raise the foreign rate; the only practicable alternative would be to lose a part of the foreign market. This would be the last thing which American producers would desire. We cannot help thinking that the Produce Exchange chiefly regrets the loss of trade as middlemen. We are reminded of a story which is told of the people of Hartford at a time when rail communication was first established between New York and Boston. They were glad to have the railroad, but were disposed to insist that the New York station should be at one end of the town and the Boston station at the other, that all the passengers might have to stop in Hartford for dinner. Is not the attitude of the Produce Exchange somewhat after this fashion? We fear that they would destroy a great deal of trade in their anxiety to handle a little.

The Wear of Tires.

The illustration which will be found on another page shows very clearly the exact form assumed by some driving tires that had achieved the remarkable record of having made 329,009 miles without re-turning. It might be expected that the wear would have been very large and that the tread would have worn very hollow, and would really have been considered unfit to run on roads where locomotives are always kept in first-rate condition. The sections, however, show that the wear was not excessive and was very fairly distributed. The flanges are not cut and are not very deep, being only 1½ in. high from the lowest part of the tread. The wear on the outer portion of the tread appears to show that the wheels were not tight to gauge, and the tire frequently ran on its outer edge. The wear on the rear driver is slightly less than that on the main drivers, a result which might be expected.

If equally good results could be obtained from all tires, the economy would be so marked that it is important to know every fact that tends to throw light upon the manner in which this result was obtained. The particulars as regards the load on wheels, grades, curves and condition of roadbed show that the conditions were favorable, except that it seems possible that the wear might have been more even had the Ross brake shoe been used instead of an ordinary wrought iron shoe secured to a cast iron brake block. The total wear being ⅝ in., the mileage per $\frac{1}{16}$ in. reduction in thickness of tire was nearly 55,000 miles. This amount is largely in excess of that usually obtained at the present day, but it appears that when crucible steel tires were used on the comparatively light engines running 20 years ago, even the mileage given above was occasionally surpassed.

Some statistics given in the report of the Master Mechanics' Association for 1870 state that the maximum mileage per $\frac{1}{16}$ in. wear was 78,338 miles on the Kansas Pacific, 99,320 miles on the Kentucky Central, and no less than 105,369 miles on the Cincinnati & Indianapolis Junction. On the two later lines the average mileage per $\frac{1}{16}$ in. wear varied from 46,768 to 62,563 miles. These figures were far in excess of those reported by other roads, the general average mileage per $\frac{1}{16}$ in. wear based on the results given by 6,206 tires on many different roads being only 15,868 miles. The committee who drew up this report state that they are confident that there must be great inaccuracy in some of the figures, but some members of the Association personally testified to the extraordinary mile-made by particular sets of tires. The great differences in the results obtained are very noticeable. The largest individual and average mileages were obtained with Krupp tires, which were also reported to have had the fewest breakages.

The use of softer tires made by the Siemens-Martin or Besssemer process has doubtless reduced the number of breakages, but while the load on the wheels has been much increased, the mileage per $\frac{1}{16}$ in. wear has greatly diminished. The facts and figures at our disposal are, however, not sufficient to show whether the decreased endurance of modern tires is due to a deterioration in the quality of the metal, an increase in the load, less care in handling the engine or a combination of these causes. An investigation of this question would probably be profitable, as it could hardly fail to result in a large saving in the cost of tires. The Master Mechanics' Association have in past years devoted considerable attention to the durability of tires, and this subject in a new phase might well again repay research. While the durability of most parts of engines has increased, the figures appear to show that the average mileage now obtained from driving tires is considerably below that obtained 20 years ago. The material now used is of course cheaper per pound, but it seems doubtful from the following figures whether the cost per mile run has been sensibly diminished.

During the winter of 1886–7 the subject of the wear of driving tires was discussed by the Western Railroad Club, when Mr. Scott, of the Chicago & Northwestern, reported that the average mileage of 3-in. tires per $\frac{1}{16}$ in. was 9,092 miles with ten freight engines, and only 8,103 miles with 4-in. tires. Mr. Hickey, of the Milwaukee, Lake Shore & Western, stated that lightening the wheel centres had increased the mileage per $\frac{1}{16}$ in. from 8,890 to 1' 257 miles.* On the Lake Shore & Michigan Southern the average mileage per $\frac{1}{16}$ in. on 25 locomotives varied from 7,570 to 6,659 miles. On the Chicago, Burlington & Quincy the 3-in. tires on switching engines gave only 4,250 miles per $\frac{1}{16}$ in., while the 4-in. tires gave a still poorer result, 3,252 miles. The best result ever obtained with any make of tire on the Chicago & Northwestern was given as nearly 18,000 miles per $\frac{1}{16}$ in. with 4-in. tires of English make. It will be observed that this is the only result in excess of the average mileage obtained with all makes of crucible steel tires 20 years ago.

These figures show that the wear of tires varies enormously, and as rapid wear must be produced by some definite causes, it is evidently important to know what these causes are and how they can be removed or mitigated. If wear is mainly caused by the insufficient bearing surface of the tire on the rail, crushing the metal and practically destroying the cohesion of the particles, the cure is not easy. Wheels of larger diameter, and rails with wider and flatter heads, would manifestly increase the area of the surfaces in contact, but would mean a perfect revolution in existing locomotives and permanent way. The widely differing results obtained with rails point to the probability of wear being largely influenced by the chemical composition of the steel and the mechanical treatment in rolling. These points have lately been brought prominently into notice for crushed rail ends are very conspicuous, especially when in close juxtaposition to the date marked on in rolling. But the comparative wear of tires is recorded only in books and is not very self evident.

Slipping, especially when accompanied by the injudicious use of sand, is one of the most frequent and easily preventable causes of wear. The cutting of flanges seen on some roads is entirely absent on others, such as the Providence & Worcester, which has an unusual amount of curvature, and, therefore, thin flanges are, generally speaking, not the inevitable result of curves, but are mainly produced by bad workmanship, and in a few cases by bad design. This cause of wear may, therefore, also be eliminated by the exercise of a moderate amount of skill and care on the part of those in charge of the locomotive department. The enormous difference in the mileage ob-

* See *Railroad Gazette*, page 69, Feb. 4, 1887, and pages 808 and 809, Nov. 26, 1886.

tained shows that a large wastage is going on, and in some of the cases quoted above, the total mileage made by a 3 in. tire when worn out was only two-fifths of that made by the Midvale tires under the Cumberland Valley locomotive for ⅛ in. wear. The proportion of tractive force to adhesion weight was practically identical in both cases, and the engine with the least wear had the largest weight on each individual wheel, though the effect of this on the wear of the tires would be neutralized by the difference in the diameter, the more lightly loaded wheel being the smallest, and therefore making the greatest number of revolutions for an equal mileage. The enormous difference in wear in a case where many of the conditions are equal shows that the unknown conditions, the frequency of slipping, the amount of sand used, the condition of the frogs, rail ends, and the chemical composition of the steel in tire and rails, etc., must have a large influence in determining wear, and it seems probable that the weight on each individual wheel, which we cannot well alter, is not an overwhelming factor in determining the amount of wear

Many will, no doubt, observe that no mention has been made of the influence of speed on wear, but while it seems plausible to consider that the thunder of an express train must indicate a large amount of wear, practical experience shows that an express passenger engine will outlast a freight or a switcher, and that wear takes place at all speeds. While the amount of wear attending a fast engine or train may be greater in a given *time*, it is not materially greater in a given *distance* with a fast than with a slow moving locomotive. An instance of the fact that considerable wear of tires may accompany very slow speed came under the observation of the present writer some years ago. The steel tires of an overhead traveling crane were found badly worn after three years' service. The crane was heavy in itself and was constantly engaged in lifting heavy weights, and, as the wheels acted as driving wheels, they probably slipped occasionally. The wheels were also of small diameter, some 18 in., and the rails of the traveler path were generally covered with gritty dust. These factors probably accounted for the rapid wear, but as the full speed of the crane was only 1½ miles per hour, it is tolerably evident that considerable wear of tires can take place even at a very slow speed, and, on the whole, it seems probable that high speed has not an important effect on the wear of tires.

Some Lessons of an Accident.

A rear collision of passenger trains, like that on the Erie at the junction of the main line and Newark branch last Friday, deserves notice, even though by good fortune the personal injuries are few, because there are so many heavy passenger trains constantly using that junction. The geography of the case is this: West of the Bergen tunnel is a double track junction of the tracks of the main line and the Newark branch. At the junction stands a signal tower, and the junction is protected by home and distant signals on the main line and a home signal on the Newark branch. About 1,200 to 1,600 ft. west of the junction (on the branch) are the abutments of two overhead bridges, and just east of these is a curve. The draw-bridge at the Hackensack is some 4,000 ft. west of the junction. The tail of an east-bound train stopped on the branch by the home signal can be seen by the runner of a locomotive following it at a distance of at least 800 ft., probably more. The interruption to the view is by the abutments above mentioned.

There was no distant signal to protect the standing train at the time of the accident, but one is now being erected west of the abutments to be operated from the tower at the junction. The branch trains at this point have been protected by the rule requiring a brakeman to go back with flag and torpedo, and by the rule for the bridge tender to hold trains three minutes apart. In the busiest hour, that in which the accident took place, eight trains arrive by the branch track in 53 minutes, and the shortest interval, according to the time-table, is two minutes.

In the case under consideration a train left Hackensack drawbridge behind time, traveled to the junction and was there held by the home signal. It was followed by another passenger train from the drawbridge in three minutes, the prescribed minimum interval. The morning was not foggy, though there was a misty rain, and the track was slippery. The engineman approached too fast and ran into the rear car (a combination, with the baggage room at the rear); this car telescoped some 15 ft. into the car next ahead, and a number of passengers were injured.

We observe in a New York paper a statement from the general passenger agent of the road to the effect that the blame was wholly upon the conductor of the standing train for not sending back a brakeman. This is, no doubt, technically correct, but the real reasons why the brakeman did not go back doubtless were, that following trains generally approached that junction (where trains are always liable to delays) cautiously, and that, there being only one brakeman on the train, both he and the conductor deemed it essential to keep the whole crew with the train, especially as they would shortly be in the terminal depot. Quite likely there was a rule requiring trains to approach carefully. The chance afforded by such a rule, *with* the usual flagging rule, to shift the responsibility from one train to the other has been repeatedly pointed out in these columns. A conductor with only one brakeman will, unless very carefully instructed, be very likely to assume that he never must leave that brakeman behind. And yet what superintendent would justify the calling in of a flagman, even after the placing of torpedoes, unless the view were long and clear, the weather fair and no following train due? All these conditions were adverse in this case. It should need no argument to show to experienced superintendents that running trains with only one brakeman where flagging rules are inflexible (like those of the uniform code) involves conductors in frequent dilemmas where they are in honest doubt what to do. The rule, "safety first, speed afterward," perhaps shields the management, but with 300 passengers anxious to connect with a boat and ready to curse if they are detained five minutes, the conductor is under a pressure which nothing but a well trained mind and will can withstand. The superintendent who leaves an ordinary conductor to meet such pressure without special and minute instruction is constantly running a great risk.

But all this applies to all parts of this and most other roads, while at the same time it does not fully meet the case now under consideration. Safe rules can be provided for the running of trains with only one brakeman, even on a busy line like the Erie, if speed and regularity are sacrificed; but the cheap and simple device of a distant fixed signal would have provided so effectually against this collision (even without interlocking, if expense were an obstacle) that the lack of it is the chief point on which the road should be criticised. This junction within a mile or two of the New York terminus is a busy point, and trains must be frequently stopped there. A distant signal sufficiently far back to protect the ordinary train is certainly a necessity, and this has apparently been recognized for some time by the operating officers, for a time table for employés, taking effect April 1, six weeks before the accident, directs that Newark branch trains shall "be governed by * * a distant signal west of over-head bridges," etc. If this signal had been in use the accident would in all probability never have taken place. We do not, however, wish for a moment to be thought to suggest any mitigation of the punishment of the train hands who, knowing that they were not protected by a fixed signal, still disregarded the time-table rules.

Nor would we wish to carry the implication that there is now among the Erie officers any lack of knowledge of the proper uses of safety appliances, or any lack of energy in equipping with them. Within the last year great progress has been made by the road in this direction. Unfortunately the protection designed for the point in question had not yet gone into use.

Six Years' Changes in the Traffic of the Lake Shore.

In another column we give a summary of the Lake Shore report, and compare a few of the results for 1887 with those for 1886. It is not without interest to take another and more remote standard. The general results of last year's operations are in many respects not unlike those of 1881. After a period of depression the road has at last returned to something like its old prosperity. It is worth while to carry out the comparison into detail. It gives us an insight into some of the changes which have taken place in the trunk-line business during the last seven years.

The financial results in the two cases were almost exactly the same.

	1881.	1887.
Miles	1,177	1,340
Gross earnings	$17,971,000	$18,710,000
Operating expenses	11,278,000	11,030,000
Fixed charges	2,725,000	3,649,000
Dividends per share, earned	8.02	8.15
" " " paid	8.00	4.00

In other words, the gross earnings have increased three-quarters of a million, while the operating expenses have diminished a quarter of million; but the increase in fixed charges nearly offsets this gain, and the change in financial policy leaves the investors only half as much in the way of dividends.

The volume of business has changed but slightly. Tons and passengers have increased; ton and passenger mileage has diminished. The figures are as follows:

	1881.	1887.
Tons	9,165,000	9,327,000
Ton-miles	2,022,000,000	1,843,000,000
Passengers	3,682,000	3,752,000
Passenger-miles	208,000,000	206,000,000

The average length of haul per ton of freight has diminished from 221 miles in 1881 to 198 miles in 1887. In other words, the short-distance or local freight was becoming relatively more important. Another aspect of this change is seen when we compare the character of goods handled. In 1881 the road carried 1,509,000 tons of grain—one-sixth of its total tonnage; in 1887 the amount had fallen to 954,000 tons. Other agricultural products show a decrease; mineral products a decided increase. One of the most curious contrasts is seen in the two classes of iron shipments.

	1881.	1887.
Pig, bloom and railroad iron	434,000	256,000
Other iron and castings	398,000	570,000

The aggregate amount, it will be observed, was almost exactly the same in the two cases; but in 1881, more than one-half belonged to the lower grade, and less than one-third in 1887.

Not less significant is the change in the relative proportions of east and west bound traffic. Down to 1879 the former was about double the latter. In 1881 the difference was still very considerable; to-day it has practically vanished.

	1881.	1887.
East-bound	5,134,000	4,672,000
West-bound	4,031,000	4,654,000

All these things show how great has been the change in the character of the business, and would explain the increase in average ton-mile rates from 0.62 cent in 1881 to 0.67 cent in 1887, even if the rate war of 1881 were not sufficient to account for the depression at that time. It is harder to explain fully the saving in operating expense. The average freight train load has increased but slightly, from 271 tons in 1881 to 273 tons in 1887. The diminution of ten per cent. in length of haul involves a decided loss of economy. The state of things in the passenger train service is even more unfavorable. The average number of passengers per train has fallen from 73 to 61. On the whole, there can be no doubt that the conditions of passenger carriage are less favorable to the railroad now than in 1881. But this loss, such as it is, has been more than overcome in the freight business; partly by the equalization of east and west-bound movement, partly by increased intelligence in the use of railroad equipment, but most of all perhaps by the lower general scale of prices to which we have been adjusting ourselves in the past few years.

Were it not for the overburdened capital account due to the purchase of a controlling interest in the Nickel Plate, the Lake Shore to-day would be in a much better condition than in 1881. It has in the course of ten years changed from a trunk-line business of carrying the products of the West to the seaboard, to a general business, much more varied in character, and therefore less exposed to sudden fluctuations or to the sudden competition of parallel lines. Whether this general business would have been developed with so much enterprise had not the grain carrying business been so often rendered unprofitable, we cannot attempt to decide. It is enough to point out the change which has actually taken place, and the superior assurance which it gives of permanent business prosperity.

Misplaced Switches.

The record of misplaced switches for the month of April is very large, there being fifteen derailments from this cause, two and one-half times as many as the average for the past ten years. Five collisions from the same cause swelled the total to twenty, in which two persons were killed and nine injured. There are undoubtedly cases of this kind every month, whose outcome is not serious, and which we never hear of, but which nevertheless should serve as warnings impressive enough to work a diminution in the number of fatalities from such pure negligence. In one view of the matter, it is perhaps surprising that such a number of trains run over so many thousand switches daily with such remarkable immunity from accident; and there are, indeed, unnumbered faithful switch-tenders who deserve credit for this element of railroads' reputation. But nothing is more certain than that the best and most efficient servants are liable to mistakes in the performance of such a duty as this: in fact, every one knows of unfortunate blunders on the part of tried and trusted men. It is, therefore, plain that provision against disaster in the event of forgetfulness is incumbent upon railroad managers both as a moral and an economical duty.

In other words, the results of derailment by misplaced switches are so serious that managers have no right to depend for safety wholly on the memory or vigilance of one man, or even two.

Thousands of miles of road whose owners cannot afford distant signals do, nevertheless, pass great numbers of passengers safely; but there can be no question that adherence to low rates of speed is an important factor in this result, and the warning of twenty serious cases in one month is especially applicable to those roads which do without distant signals and yet allow fast running. It is to be remembered that the engineman's responsibility for accidents of this kind is often great, though it does not in the least mitigate the switch-tender's. The runner can sit on his seat and see a certain switch target, say 400 ft. before reaching it; by standing up, or putting his head out of the window, or by crossing to the fireman's side of the cab (or getting the fireman to look) he can see it, say 200 to 400 ft. further off; but only by the most careful training of himself can he maintain the habit of doing this. After finding the switch right a few hundred times he relaxes his vigilance almost in spite of himself, notwithstanding he knows that the 999th time may cause his instant death and blast his reputation as a protector of the lives of passengers if his behavior is actually known. In view of this well-known characteristic of human nature, no thoughtful person can reasonably neglect to provide all the safeguards possible. To remove all the facing points possible, and to provide distant signals for those remaining, is, or ought to be, generally acknowledged as the only reasonable practice; though even this is ignored by many roads which beguile people on to their dangerous tracks by splendid cars and splendid words about the scenery that can be viewed from their windows (as long as they remain right side up). But rebuilding of switches and putting up signals takes time. What is wanted is an immediate remedy. Are you sure that next month will not show 20 more accidents of this kind and some of them on your own road?

Careful switch-tenders should, where possible, be supplemented by another careful man to watch them. Switches should occasionally be suddenly misplaced by an inspector just before a train is due to test the fidelity of these men. Firemen should be required to *always* look out on approaching dangerous switches, and the runners should be made to hold them up to it. Their vigilance should be tested by false movements, as in the case of the station men. This is not a new idea; it has been employed to good purpose by the best officers. The greatest objections to "detective" work of this kind come, perhaps, from those who regard it as mean or underhanded to test men in such a way. But that is not a valid objection. Meanness is a matter of disposition. Inspectors should be persons whose dispositions the men know to be the opposite of mean. Kindliness of heart can be shown toward a switch-tender in correcting his habit of work as truly as in granting him a gift of fifty cents a year through an insurance association. Trusting absolutely to luck, which is a pretty truthful characterization of the attitude of many roads on this question, is unworthy of intelligent and humane railroad officers.

Some Annual Reports.

Lake Shore & Michigan Southern.—Mileage (1,341) remains unchanged; also construction and equipment account, which has stood at $84,000,000 ever since 1883. All betterments in the last four years have been charged to operating expenses. As a result of this policy, the capital account shows an actual decrease of nearly $400,000, an unusual result in these days.

	1887.	1886.
Earnings—Freight	$12,547,923	$10,329,625
" Passengers	4,650,653	4,620,549
Total, incl. misc	$18,710,944	$15,859,455
Operating expenses and taxes	11,029,798	9,731,622
Per cent	58	61
Net earnings	$7,681,164	$6,127,833
Increase in gross earnings	$2,851,507	17.98 per cent.
Increase in operating expenses	1,298,176	13.34 per cent.
Increase in net earnings	1,553,331	25.35 per cent.

Net earnings, 1887	$7,681,164
Interest, rentals, etc	3,649,615
Surplus earnings—equal's $8.15 per share of stock	$4,031,549
Paid two dividends—2 per cent. each—4 per cent.	1,978,660
	$2,052,859
Add sundry item—profit and loss	841
	$2,053,701
Decrease in aggregate liabilities	$377,678
Increase in aggregate assets	1,676,022
	$2,053,701

Of the increase in freight earnings it may be said that three-quarters is due to increased business and one-quarter to increased rates.

Of the $1,300,000 increase in operating expenses, the one item of repairs to freight cars accounts for nearly $400,000 ($1,000,000 in 1887 against $629,000 in 1886), while repairs of locomotives will explain $250,000 more. Hardly any of the items of "transportation" expense in its narrower meaning show an increase at all proportionate to the expansion of business.

From the multitude of statistics which the Lake Shore habitually furnishes, we select a few of the more important:

	1887.	1886.
Tonnage	9,326,852	8,305,597
Average haul, miles	197.7	191.7
Ton-mileage, millions	1,844	1,592
Receipts per ton-mile, cents	0.67	0.64
Passengers carried	3,752,840	3,715,508
Average journey, miles	55	51½
Passenger mileage, millions	203	192
Receipts per passenger mile, cents	2.26	2.10
Average train-load, freight-tons	273.4	259.5
" " passengers	61.0	55.7

All these things show a decided change for the better as compared with 1886. On the whole, they make a good showing as compared with almost any previous year in the history of the road. This matter is discussed in another column.

It is interesting to know that east-bound and west-bound tonnage have been brought to a substantial equality. The average length of haul on east-bound business still remains considerably greater.

Michigan Central.—The general policy of the company has been very much like that of the Lake Shore, the increase in construction account having been but slight. The results of the year's operations are not quite so good, the increase in operating expenses having been very considerable. The results are as follows:

	1887.	1886.
Earnings—Freight	$9,299,987	7,938,572
" Passenger	4,184,236	3,670 825
Total, including miscellaneous	14,164,490	12,295,827
Operating expenses and taxes	9,875,246	8,404,679
Net earnings	4,289,244	3,891,148

Of this sum, $2,536,000 went to interest and rental; $540,000 went to the Canada Southern; leaving a net balance of over $1,200,000, or more than 6¼ per cent. on the capital stock. Four per cent. was paid in dividends, and the balance ($483,000) carried to surplus.

The large increase in operating expenses was due to the fact that the increased freight earnings came from growth of traffic at substantially the same rates as before, thus necessitating a large increase in items like fuel consumption. The rate per ton-mile was 0.694 cent in 1887, against 0.686 in 1886; the rates per passenger mile were 2.29 and 2.14 cents respectively.

Lake Erie & Western.—The report for the fractional year (eleven months) ending Dec. 31 shows the following results:

	1887.	1886.
Earnings, freight	$1,135,262	$1,000,737
" passenger	531,806	457,466
Total, including miscellaneous	1 899,314	1 659,194
Operating expenses	1,127,634	1,269,627
Percentage oper. exp. to earnings	59 37	76.51

The increase in earnings is gratifying, but the diminution in operating expenses is more apparent than real. If we look at the different items we find that:

Maintenance of way decreased	$51,000
" " equipment decreased	77,000
Transportation expenses increased	34,000
General expenses decreased	48,000

The last item represents a real saving; the lessened payments for maintenance probably do not. In point of fact, more than half of the apparent net earnings was spent for betterments. Some of this expenditure doubtless represented new construction; but we think it altogether likely that if the expenditures on track and equipment had been charged in 1887 in the same way that they were in 1886, the maintenance expenses would have shown an increase instead of a decrease.

Making all due allowance for this, the showing is still creditable to the officials of the road. There is nearly 15 per cent. increase of gross revenue, with only 6 per cent. increase of transportation expenses. This indicates careful handling, and the impression is confirmed by the average locomotive performance of 36 miles run per ton of coal. Another year will give us fuller comparative figures.

In a recent issue of the New York *Herald* a gentleman who disclaims any right to the title of engineer, but who is represented as an unprofessional man who has lain awake nights thinking about the Brooklyn Bridge, discourses pleasantly to a reporter about his plan for operating the bridge railroad. This inventor, Mr. Gillin, has patented several things, but he does not say positively that he has patented this design. He expects to patent a good many other matters, but "for the last few days he has devoted *all* his time to the plan for increasing railroad facilities on the Brooklyn Bridge." So far as pecuniary gains go it would probably have been better for Mr. Gillen had he spent those few days in inventing something else, for we fear that he has been anticipated in this conception. Indeed, had he not said distinctly that he lives in Brooklyn we should have suspected that his home is in Hoboken, and we still think that he must make occasional trips to the heights in the rear of that charming town which are reached by the cable cars of the North Hudson County Railroad, for his plan is precisely that in the Hoboken terminus of that company. The Hoboken road now runs one-car trains, while Mr. Gillin proposes to run nine or less, and his approaches to and exits from the loading and unloading platforms are different from those in the Hoboken station, but otherwise the plans are the same in general and in detail. By this plan incoming trains are switched across to a prolongation of the outgoing track, and the passengers leave the cars on one side and enter on the other. When the train is loaded the cable is picked up and the train moves off, and another train drops across behind it. All movements are made by the main cable, and locomotives would be required only for storing cars or in case of accident. The plan is extremely simple, but with trains run at the shortest possible intervals there would exist considerable danger of collison between loaded trains. So far as we can judge the minimum time required for the Hoboken one-car train to run in, unload and load, would be 1¼ minutes. This is the result of some observations of the trains as actually run. For a nine-car train the time required to safely clear the switch, and to unload and load, would probably be three minutes. This would give a capacity considerably less than the trustees expect from the plan adopted, and the plan would certainly be more dangerous on the bridge, although perfectly safe when worked with the long intervals possible on the Hoboken road.

The New York Central is making the preliminary changes necessary to adapt its tracks to the running of trains on the left instead of the right hand over the approaches to the Grand Central station in New York City. This is in pursuance of the long contemplated plan to avoid the grade crossing at 53d street where the inward and outward main tracks cross each other for the purpose of running inward trains to the easterly side of the station. The arrangement of the main station and the adjoining train shed, which was erected a few years ago for inward trains, is such that trains must both enter and leave on the left hand. By the new arrangment outward trains will continue in the same manner to the nearest junction. The Hudson River trains will run to Spuyten Duyvil, the New Haven trains to Woodlawn Junction and the Harlem division trains to White Plains, as far as the double track extends on that division; inward trains of course follow the same rule between the same points. As trains already have to slacken speed at these junctions, there is little increase in complication, and the elimination of the Fifty-third street crossing is substantially a clear saving. Although this crossing has been used by hundreds of trains daily for many years with a remarkable record of safety, its removal has been deemed necessary on account of the delays it occasions. It is only about 2,000 ft. from the station, and every outward train which is stopped by the passage of an inward train is obliged to stand across several switches; this greatly hinders switching operations, and prevents following trains starting out of the station. All of the portions of the road above mentioned (except north of Woodlawn) are worked on the absolute block system, and new semaphore posts and arms are being erected at each block by the Union Switch & Signal Co. Quite extensive changes in the interlocking are also being made in the Grand Central yard, and at the Harlem River drawbridge. The new semaphores are placed on the right-hand side of the post. All the old ones are on the left.

The third and fourth tracks, which now extend to 125th street only, will be continued about ½ mile to the Harlem River at once, and the prosecution of the same work, together with the $1,500,000 change in grade and construction of overhead bridges between Harlem River and Woodlawn, is to be soon actively entered upon, some grading having been done already. Clark & Westbrook are the contractors for the earthwork and masonry.

The recent explosion at Locust Gap, Pa., is followed almost within a week by a similar one at Fountain, Col. A freight train on the Atchison, Topeka & Sante Fe engaged in switching in the night at Colorado Springs, left five cars standing on the main track. The brakes on these cars were loosened and they ran back down grade 17 miles to Fountain, where they collided with a passenger train standing at the station. Naphtha in one of the cars immediately spread through the wreck and on the ground, setting everything afire. One of the cars contained 17,000 lbs. of giant powder. It appears that the trainmen knew of this and warned passengers and bystanders to take themselves out of the way. This car took fire and, about 20 minutes after the collision, exploded. Nothwithstanding the warning which had been given, 3 persons were instantly killed, 3 fatally wounded and 18 others seriously injured. It is claimed that the brakes on the runaway cars were loosened by a tramp. The explosion was heard at Pueblo, 45 miles away, and every house in Fountain was damaged.

The Boston *Herald*, commenting on the Pennsylvania explosion, refers at length to the Massachusetts laws restricting the transportation of explosives. These laws forbid the transportation of the most dangerous kinds, and require cars "specially provided for the exclusive carriage" of other kinds. An agent of the owner must accompany the goods, "and never leave the car." The law is good as far as it goes, but it is obvious that it would have had little or no effect in these two cases. An "agent of the owner" might not have known enough to stop the runaway cars if he had been there, and he certainly would have had difficulty in handling the 70 at the Locust Gap, or in doing anything toward getting the forward portion of the train out of the way on that occasion. Clearly the railroads themselves must take special care with trains containing such dangerous stuff as oil and powder. And warnings have been plenty of late, at least as regards oil, so that there is no excuse now for slackness. Did not the telegraph carry the news from Locust Gap as far as Colorado?

It is a pleasure to note the fact that the Chicago, Milwaukee & St. Paul has now no stub switches in its main tracks. We believe this statement is literally true, but if not, it is essentially so. Split switches have been put in throughout the system. Most of the track of this company lies in the region of heavy and long continued snow, and the cost and incon-

venience of operating split switches in such regions will be felt in all their force by the Chicago, Milwaukee & St. Paul people; but we have every confidence that their courage in making the change will be justified in a financial way as well as in other ways. The company is doing a good deal in interlocking also, and has recently made some interesting applications of block signals to single track working. We learn that the long angle-splice, thickend in the middle, which has for some time been standard on the road, continues to give perfect satisfaction.

The board of engineers appointed to examine the Arthur Kill bridge site and plans has submitted majority and minority reports to the Senate Commerce Committee. The majority recommends that the clearance should be 50 ft. above high water, that the main span should be 400 ft. clear, and that the draw should be on the Jersey side. As now building, the draw is in the middle, and has openings of 225 ft. each. The height is 32 ft. above high water. The minority reports that 81 per cent. of the commerce of the Kill will not be affected by the bridge as now designed, and that the remaining 19per cent. may be properly asked to endure some inconvenience for the public good. At least this is the interpretation of the meagre telegraphic dispatches. The draw span is now being erected, and one shore span will be raised within a week. All the iron for the superstructure is now on the ground. The adoption of the majority report therefore would involve the re-building of nearly the entire superstructure and the removal and re-building of at least three of the piers, which are costly structures, in deep water. A further very serious expense would be entailed by the added height, in the approaches, which are from low ground.

Some inquiries have been received as to the present state of the work of extending the Oroya Railroad of Peru. The road has been built for over 10 years to Chicla, 87 miles from Callao, 12,220 ft. above the sea, and the project is to carry it 49 miles further, to Oroya. The line is located throughout, and tunnels were driven on the extension some years ago. Some construction is now being done on the extension, but the completion of the line depends on the final action of the government of Peru on the contract now before it. It will be some months, it is said, before definite action can be taken by the government.

A curious illustration of the improvement in the rate of travel during the last sixty years is given in the following table, giving the time occupied on the journey between London and Paris. The time lost in transferring passengers from the train or coach to the boat and *vice versa* is not included :

	1828. Hours.	1848. Hours.	1868. Hours.	1888. Hours.	1889. Hours
London to Dover	12	3½	2½	1¾	1¾
Dover to Calais	6	2½	1½	1	¾
Calais to Paris	36	8	6½	4½	4
Total	54	14	10½	7¼	6½

In 1828 the land journey was made by mail coach and diligence, and the sea passage by sailing boat; but in 1848 railways and steamers were used. The improvement has been continuous, and though the distance on the French side has been shortened a few miles, the higher speed is chiefly due to mechanical improvements.

The large reductions in railroad freight rates during the last few years are well known, but probably few are aware that the rates of freight by transatlantic steamships have also been enormously reduced within a very short period. An English contemporary, *Industries*, states that the fall of prices of ocean transit from New York to Liverpool has been as follows :

	1880.	1886.
Grain, per bushel	9¼d.	1d.
Flour, per ton	25s.	7s. 6d.
Cheese	50s.	15s.
Cotton, per pound	⅝d.	7/32d.
Bacon and lard, per ton	45s.	7s. 6d.

It is therefore not surprising that the Cunard and other companies engaged in this trade find it impossible to pay dividends.

The American Brake Co., of St. Louis, is developing a new air brake which is specially intended for use on freight trains. A suburban train equipped with this brake is now running as an experiment, and it is said that trials with 50 cylinders and 2,000 feet of pipe arranged in the Brake Company's shop show that the brake will go on the last car of a 50-car train in 1½ sec. without the aid of electricity.

NEW PUBLICATIONS.

The *Report of the Third Annual Meeting of the Illinois Society of Engineers and Surveyors*, which was held at Springfield, late in January, was issued about the first of this month. The Society deserves credit not only for the unusual promptness with which this report appears, but also for the variety and excellence of the contents. Besides the official records of the proceedings, and reports of committees, the pamphlet contains 16 different papers on a variety of subjects. The Society numbers about 75 members, among whom are a number of railroad officers. Mr. Hill, Chief Engineer of the Indianapolis, Decatur & Springfield, contributes an interesting paper, illustrated, showing a masonry arch culvert recently built on the line of his road, and Mr. Balcom, Assistant Engineer on the Illinois Central, contributes a paper on the Cairo bridge. These two are among the longest of the individual papers and, including a brief one on the Replacement of Wooden Trestles with Iron and Stone Structures, by Mr. Healey, Division Engineer Illinois Central, are probably those of greatest interest to railroad engineers. The Report can be had of the Secretary, Prof. A. N. Talbot, Champaign, Illinois. The price is 50 cents.

The *Official Railway List*, published by the Railway Purchasing Agent Co., Chicago, has recently been issued for 1888. This is the seventh annual edition of this extremely convenient little handbook. It is so well known that it requires no other mention than the mere announcement of its issue.

Demurrage on the New York & New England.

[The following circular, referred to in these columns last week, was inadvertently omitted from that issue.]

The New York & New England road has had in effect since April 1 a system of collecting demurrage on detained freight cars at all stations, both competitive and non-competitive. The rules under which the system is operated are substantially as follows : All cars set out to be loaded by shippers or unloaded by consignees, 75c. per day after 48 hours. Fractions of a day, when less than four hours, not to be counted. Cars on private sidings, 50c. per day. After charging for five days, the rate will be increased to $1 per day, whether on the company's track or private sidings.

When cars are stopped en route at the request of shippers, or are held at any point because the track upon which they should be unloaded, or the portion of the company's track reasonably alloted therefor, is filled with cars which the same consignees have neglected to load or unload, the charge will be 75 cents per day.

The road reserves the right to unload after 48 hours, charging 15 cents per ton (minimum, $2 per car). Storage will be charged on all freight, whether carloads or smaller lots, after 48 hours, at the rate of 5 cents per ton (minimum, 5 cents per 100 cu. ft.). Neither storage nor demurrage will be charged for Sundays and legal holidays. In case of freight stored, the road will be responsible as warehouseman only.

When the company needs the use of the cars, warehouse or tracks, and cannot conveniently store the freight upon its own premises, it will be stored at the risk and expense of the owner, at the most available place of public storage; and should there be no such place at or adjacent to the station where the cars were destined, the freight will be transported in the cars to a station where such storage may be had, and the regular tariff rates for such transportation, and the return, if returned, will be charged, together with all expenses incurred for and relating to such storage. All consignments stored by the company in public or privates warehouses will be subject to the charges customarily made by the proprietors thereof.

TECHNICAL.

Locomotive Building.

The Taunton Locomotive Works has delivered to the Fitchburg a new switching engine.

The Brooks Locomotive Works, at Dunkirk, N. Y., have equipped their works with a plant of 150 incandesent electric lights.

The Rhode Island Locomotive Works, of Providence, R. I., are constructing ten consolidation locomotives for the Louisville & Nashville, and six for the Minneapolis, St. Paul & Sault Ste. Marie. Three of the latter are Moguls and one is of the "Forney" pattern. They are also constructing a number of consolidation locomotives for the Seattle, Lake Shore & Eastern, and several ten-wheeled locomotives for the Southern Pacific and Chicago, Milwaukee & St. Paul. Several switching engines are also being constructed for the Cincinnati, New Orleans & Texas Pacific.

Ryan & McDonald, of Waterloo, N. Y., have just completed a small engine for Nolan Bros., of Reading, Pa., which will be used on their contract for double tracking the New York, Lake Erie & Western between Ararat Summit and Carbondale, Pa.

The Baldwin Locomotive Works have delivered three of the 14 locomotives they are building for the Chicago & Eastern Illinois.

Car Notes.

The Barney & Smith Manufacturing Co., of Dayton, O., has completed the first 60 of the 5,000 freight cars which it recently contracted with the Southern Pacific to build.

The Lafayette Car Works, Lafayette, Ind., have commended the delivery of the freight cars recently ordered by Chicago, Burlington & Northern. They are of 50,000 lbs. capacity, 34 ft. long.

Harris, James & Co. will soon complete the contract with the Intercolonial for 170 box cars, which are being built at the St. John (N. B.) shops, and will then commence building 30 ballast cars for the same road.

The first lot of 300, 60,000 lb. ore cars built at the Louisville & Nashville shops at Louisville, Ky., for the Birmingham Mineral road, were received at Birmingham last week.

The Anniston Shops of the United States Rolling Stock Co. are at work on a large order for freight cars for the Anniston & Cincinnati.

The Cincinnati, New Orleans & Texas Pacific has nearly completed the construction of 200 box cars at the shops at Ludlow, Ky.

It is stated that the Canadian Pacific has contracted with the James Crossen Car Works, Cobourg, Ont., for the building of 2,000 box cars, and will also build 3,000 at their own shops at Montreal. It is also stated that 200 locomotives will be completed by next year.

The Maine Central has just completed 53 flat cars at the new shops at Waterville, Me., and are now building two passenger and one combination car and will soon commence building 200 flat and 300 box cars. They are also doing general repairs on Pullman passenger and freight cars.

The Terre Haute Car & Manufacturing Co., of Terre Haute, Ind., is delivering ten 60,000 lb. coal cars a day to the Chicago, Milwaukee & St. Paul.

Bridge Notes.

The County Commissioners of Wellington, Kan., will erect five iron bridges. Address George Camp, Chairman of the Board.

The County Commissioners will erect an iron bridge at Canfield, Minn.

The County Commissioners will erect two bridges at Kasson, Minn.

A bridge is to be erected at Mantorville, Minn., by the County Commissioners.

Proposals are asked until June 5, by Jacob Shaefer, County Clerk, Cuming County, Neb., for erecting two iron bridges.

The Berlin Iron Bridge Co., of East Berlin, Conn., has been awarded a contract to construct an iron bridge over Mill River, at Stamford, to cost $10,627.

The Board of Supervisors of Milwaukee County, Wis., will erect a bridge across the Menomonee River in Wauwatosa.

It is reported that the Highway Commissioners of Barton, N. Y., will erect an iron bridge.

The St. Louis Iron Bridge Co. has contracted for the construction of a 108 ft. single span bridge over Sholes Creek in Clinton Co., Ill.

Manufacturing and Business.

J. A. Fay & Co., Cincinnati, O., have shipped 12 car loads of their wood-working tools to the Alabama Great Southern, completing that road's order. The tools are to be used in the wood-working department of the shops of the road at Birmingham, Ala.

The Laidlaw & Dunn Co., of Cincinnati, O., has contracted for the building and erection of two "Duplex" steam pumps to pump water for the grand water falls and fountains in Horticultural Hall, and also for the large elevator pump for the Washington Park Department, at the Cincinnati Centennial Exposition, which will open July 4.

Bids are asked until June 6 by the Newark (N. J.) Aqueduct Board, for furnishing a 5,000,000 gallon pumping engine on Clifton avenue, which may be of the horizontal, duplex, beam or vertical compound type. Specifications may be seen at the office of the Civil Engineer of the Board.

The Massillon Machine Co. has been organized at Massillon, Ohio, with a capital stock of $25,000, by H. F. Jones, George Phillips and others.

The Chapman Valve Mfg. Co., of Boston and Indian Orchard, Mass., has opened a salesroom and office at 24 West Lake St., Chicago.

The Babcock & Wilcox Co., of New York, placed the following boilers among others, during March and April : Philadelphia Co., Pittsburgh, 152 h. p.; Massachusetts Inst. Technology, Boston, 208 h. p.; South Bend Iron Works, South Bend, Ind., 3d order, 150 h. p ; Cie Francaise d'Elairge Electrique, Paris, France, 136 h. p.; Cornell University, Ithaca, N. Y., 2d order, 500 h. p.; London Elec. Supply Cor'n, London, Eng., 3,000 h. p.; Troy Steel & Iron Co., Troy, N. Y., 3d order, 1,248 h. p.

The Electric Train Signal Co., of Chicago, has been incorporated in Illinois with a capital stock of $100,000 by Charles S. Olven, and others.

The Wainwright Mfg. Co., of Boston, Mass., report the following sales, among others, of their corrugated tube feed-water heaters during the month of April: Two to Lowell; one each to Taunton, Worcester, Portland, Providence, R. I.; seven to New York City; and one each to Cleveland and Chicago, Ill.

Charles A. Schieren & Co., of 78 Cliff street, New York, report recent sales of their leather link belting to 21 different firms, no two of which are in the same state, and which include a great variety of industries.

The water coolers manufactured by the Union Indurated Fibre Co., designed for the use of railroads, are said to be having a large sale. Coolers of from three to six gallons are carried in stock, and the company is prepared to furnish all sizes up to 30 and 35 gallons promptly. It is stated that they have just received an order for a number of these large coolers from the Pennsylvania for use in their stations, and their pails and cuspidors are used on this system.

Iron and Steel.

The Thomas Iron Co., Hokendauqua, Pa., is blowing out No. 5 furnace, which has made a run of 3 years and 15 weeks.

East Conemaugh Furnace of the Cambria Iron Co., Johnstown, Pa., is being rebuilt. The company has sold to the Dayton, Fort Wayne & Chicago 4,000 tons of steel rails.

The Vulcan Furnace Co., operating the furnace at Newberry, Luce County, Mich., has been succeeded by the Newberry Furnace Company.

Etna Furnace, Etna Iron Works, Limited, New Castle, Pa., blew out April 20 for an indefinite period.

Fannie Furnace, of the Wheeler Furnace Co., at Sharon, Pa., which has been out of blast since December of last year, has been thoroughly repaired and relined, and was blown in on May 1.

Edith Furnace, of the Edith Furnace Co., at Allegheny City, Pa., will be blown out this month for relining and other repairs. As soon as these are completed it will at once resume operations. The furnace turns out about 700 tons of No. 1 pig iron per week, which is consumed by the National Tube Works Co., of McKeesport, Pa.

The Rebecca blast-furnace and Isabella No. 1, at Kittanning, Pa., are now being relined and both furnaces will probably be ready to be started up in a month.

A receiver has been appointed for the Iowa Iron Works, of Dubuque, Ia., and will continue the operation of the plant.

The construction of a blast-furnace at Duluth, Minn., for the Duluth Iron & Steel Co., has been begun under plans prepared by John Birkenbine, the engineer of the company, and embraces a twin blast-furnace plant. The furnaces are to be 16 × 75 ft. each, equipped with three regenerative hot-blast stoves. The buildings for the twin plant will be erected at once, but the contracts for the ironwork and machinery of but one furnace will be let at present.

The firm of Benjamin Atha & Co. has been incorporated in Newark, N. J., with a capital of $750,000. The controlling interest in the company is held by Mr. Atha. In connection with the new steel company, the Atha Tool Co. has been incorporated with a capital of $100,000. The new company will operate the works on the Passaic as well as the newly acquired plant in Jersey City, and Mr. John Illingworth, who was bought out by his partner, Mr. Atha, will start at once to build a new steel works, with a capital equal to that of the Atha Co.

The converter of the Bessemer steel works of the Colorado Coal & Iron Co., Pueblo, Col., commenced running at full capacity April 21. The rail mill started at its full capacity on the 23d making steel rails.

A new furnace has been built at Hayden's Rolling Mill, Columbus, O., which manufactures the gas with which the furnace is heated to melt the iron.

The Findlay La Grange Rolling Mill, at Findlay, has been sold to the Aluminum Product Co., of New York, which, it is stated, will spend $200,000 in making improvements at Findlay.

Mackintosh, Hemphill & Co. have contracted to make the engines and trains of rolls for the new steel rail mill of the Allegheny Bessemer Steel Co., to be located at Duquesne, Pa. The engine will be 46 × 60 in., and the trains 26 and 21 in.

The Edgar-Thomson Steel Works were put on double turn in all departments on May 7. Four of the blast furnaces are blowing.

The Pittsburgh Steel Casting Co. is shipping one car load of Wall's patent corrugated rolls to the Australian gold mines, and have just received an order for another car load to be

sent to Utah, which will make five car loads they have furnished of these shells.

The Stony Creek Rolling Mill Co. at Norristown, Pa., has been closed for an indefinite period.

The Delaware Rolling Mill at Phillipsburg, N. J., has also shut down.

The West Superior Iron & Steel Co., of St. Paul, Minn., has been incorporated with a capital stock of $2,500,000, by R. L. Belknap, New York City; R. H. Wemyss, T. S. Oakes, St. Paul; J. H. Ames, St. Paul, and others.

The steel works and sheet rolling mill of Henry Disston & Sons, at Tacony, Philadelphia, were destroyed by fire May 13, causing a loss estimated at $300,000, which is insured for $190,000. It is not expected that the filling of contracts will be materially interfered with.

The Rail Market.

Steel Rails.—The report of the Board of Control shows that the sales up to May 1 have amounted to 721,000 tons. During the week but a few lots of 500 and 1,000 tons have been placed by eastern mills, and no large sales are reported from the west. Quotations: $30.05@$31 for standard sections at eastern mill,

Old Rails.—Sales have been made, principally to eastern manufacturers, of lots in store aggregating 5,000 tons. $20.50 is bid for tees on cars.

Journal Bearings.

The Ajax Metal Company is contracting to supply its metals to companies which use them exclusively, with the following remarkable guarantee: "That the metal shall not cost, on an average, any more than the composition the said * * * railroad company are now using; that the Ajax metal will show increased service in mileage of fully 50 per cent; that with ordinary attention there will be no hot brasses, whether under their heaviest or lightest rolling stock, or their fastest or slowest schedule time." Provision is also made in the agreement for penalties, to be determined by three disinterested parties.

Asphalt Pavements in Berlin.

Asphalt pavements in the city of Berlin have steadily increased in area in the last ten years. In 1878 there were only 23,586 square metres of such pavements in Berlin, while in 1887 the figures had increased to 417,000 square metres.

Purification of Mineral Oils that have been Already Used.

By a German process the oil is filtered through sawdust or cotton waste. If the oil shows turbidity, it is left for 12 to 24 hours at a temperature of 122 degrees F. before being filtered. If the oil is dark, its color can be changed to a light shade by mixing it with one to two per cent of its weight of sulphuric acid. Water is added, and sufficient of a solution of soda to neutralize the acid is also added, the mixture being afterward washed by the addition of clean water. The oil can be used for lubricating purposes, without fruther addition, when purified as above. It is, however, better to mix it with fresh oil, using about 25 per cent. of the purified oil in the mixture.

German Rolling Stock.

The amount of rolling stock on German railroads is stated as follows, the increase being considerable during the last four years:

	1883.	1887.	Increase p. c.
Locomotives	5,858	8,420	43
Passenger cars	9,028	13,012	44
Baggage cars, etc.	2,435	3,547	45
Freight cars	124,801	162,277	30

Annealing Steel Boilers.

The *Marine Journal* states that a discovery of great importance to steamship and steamboat owners has recently been made by George V. Sloate, Superintendent Engineer of the Old Dominion Steamship Line. It is a well-known fact that steel plates forming the furnaces and connections of marine boilers after a few years' use become crystallized, and crust to such an extent that in many cases they have to be renewed at great expense. By using Sloate's process of annealing about once every three years the metal is fully restored to its normal condition, viz., full strength, ductility, and proper reduction of area when tested. This treatment will insure the furnaces and connections lasting as long as the boiler. Boilers with the advantage of surface condensers should, with proper management and care, give twenty years' actual service, with moderate cost for repairs. The furnaces of the steamships *Roanoke* and *Guyandotte*, after five years' service, commenced to crack over the bridge walls to such an extent that the company had to renew two of them on each ship. Upon examination it was found that the steel in the old furnaces had become crystallized, and was as brittle as cast iron; in fact, it resembled the latter more than the original steel. By heating it to a mild red heat, and afterwards allowing it to cool off, gradually, the apparently worn out metal was restored to its original condition and tensile strength. Thus it was Mr. Sloate conceived the idea of heating and annealing it. The work of accomplishing this object is very simple. The boiler is emptied of water, all manhole and handhole plates are put on, and the boiler is hermetically sealed. Before closing the furnace doors a bridge wall is built up within 3 in. of the furnace all round. After this a form is made of boiler iron, 2 ft. less in diameter than the furnace, and about 3 ft. long. The space between is then filled with chemical or tinder dried wood, after which the ash pans are closed and the fires lighted. When a red heat is reached the dampers are closed and all air excluded from furnaces. The fire burns slowly for from twenty-five to thirty hours, and after all the wood is consumed the furnace is allowed to cool off gradually. Upon opening the furnaces the steel is found to have become annealed and restored to its normal condition without any injury to the boiler or loss of time to the ship. The boilers of the steamships *Seneca* and *Guyandotte* have undergone this treatment, thereby saving the owners the expense of repairing the furnaces.

Cloud's Tire Fastening.

A new tire fastening, the invention of Mr. John W. Cloud, is being applied to the truck and tender wheels of passenger engine No. 46, recently built at the Susquehanna shops of the New York, Lake Erie & Western.

THE SCRAP HEAP.

Japanese Railroads.

The first railway constructed in Japan, which connects Tokio and Yokohama, was opened in June, 1872, and is the only double track line in the country. There are now open 245 miles of government lines. 254 miles are in progress, and 52 miles more are in contemplation. There is also a line of 56¼ miles in the island of Yezo. The Japan Railway Company, on whose paid up capital the government guarantees 8 per cent. interest, has 289 miles of line open, and contemplates a new railway from Sendai to Awomori, a distance of 240 miles. The construction of a number of private railroads has also been sanctioned by the government.

Thou Shalt Not Discriminate.

Railroad Agent.—No, sir; under the Inter-state law I can't carry your company for less than four dollars and a half apiece; but I'll tell you what I'll do, seeing it's you. Let's see; how many people have you got?

Theatrical Agent.—Twenty-seven.

Railroad Agent.—Well, I'll have to charge you the full four-fifty, but I'll send you over the line with a conductor who can't count more than twenty.—*Puck.*

Puck's artist apparently paints from nature, nowadays.

A New Name, But a Good One.

The *Iron Trade Review*, describing some locomotives now building in Chili, says of them: "The general design is the American with the American logic, and with cylinders on the outside, instead of on the English plan."

A High Co-efficient of Adhesion?

Union Pacific engine 826, which brought in the Denver train one morning in March, was frozen to the track while standing at the transfer depot, says the Omaha *Republican*. The track on which the train was standing is rather low and was covered with water. The engine stood there some time, and when an attempt was made to back the cars out it was found that the driving wheels were frozen fast. After spending some time in the fruitless attempt to thaw the ice with hot water, a switch engine was called upon to pull the disabled engine out.

Railroad Connection between Finland and Sweden.

The special committee of the local assembly of Finland, to whom the project of a railroad from Uleaborg to the Swedish border had been referred, has decided against the building of such a line at present, the reason being, that while the proposed line would be of benefit to the country only in the future, there are several other projected lines that would be of benefit in the immediate present to local commerce and industry, and these should be constructed before the international line can be thought of.

Pipe Line in Russia.

The Russian government has given the concession for the construction of a pipe line for carrying petroleum from the Apscheron Peninsula to the Black Sea ports of Poti and Batoum. The carrying capacity of this line will be not more than 240,000 puds yearly. The concession has, however, been granted, with the proviso of a special tax to be paid by the company to the government on all quantities carried through the line.

The Siberian Railroad.

It is announced that the Pacific terminus of the Siberian Railroad will be at Vladivostock, on the Japan Sea, near the Corean border. The road will connect Najinsk, Chita, Irkutsk, Tomsk, Tobolsk and Ekaterinburg. The latter place is near the European border, and connection will be made there by an existing road to St. Petersburg.

Opening of the Erie Canal.

The Erie Canal was opened officially at midnight May 9. There was a fleet of over fifty boats waiting to go through the big tier of locks the moment the clock struck twelve. The men are not particularly happy. The outlook for freight rates is unpromising.

Floods.

Floods have been reported during the past week from the northern peninsula of Michigan, along the line of the Duluth, South Shore & Atlantic road, and from various points on the Mississippi River, between Winona and St. Louis. Thousands of acres of growing wheat have been destroyed in the vicinity of Quincy, and all the railroads there are submerged except the Wabash and the main line of the Burlington. At Winona, Minn., and at Keokuk, Ia., tracks were submerged and much damaged, and trains were delayed by inundations along the line of the Connecticut River in New Hampshire and Vermont.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Indiana, an act was passed by the Legislature incorporating a railroad company, and four days later, at the same session, the act was amended so as to require the company to commence the construction of its railroad within four years and its completion within ten. The Supreme Court decides that this was within the power of the Legislature; but that where a number of years after the time fixed for the completion of the railroad, a possessory action is brought for a strip of ground over which the road has been constructed, the plaintiff cannot avail himself of the failure of the corporation to complete its railroad within the time required by the act amending its act of incorporation. The duty imposed upon the company was owing to the State, and not to individuals, and the State alone had a right to enforce that duty or sue for its breach. A private individual cannot avail himself of a failure to do what the law required, unless what was required affected his private rights.[1]

In Kansas the Supreme Court holds constitutional the statute of that state forbidding a carrier from bringing into the state cattle suffering from Texas, splenic, or Spanish fever. It also rules that where a railroad, transporting through this state, upon a train of cars, cattle diseased with the Texas, splenic, or Spanish fever, has its train wrecked within the state, so as to make it necessary to unload the cattle; and thereupon is notified that the cattle are from Texas, and will spread disease among the domestic cattle if permitted to run at large, or if driven upon the public highway, it should *corral* the cattle at or near the wreck, or otherwise prevent them from running at large, or getting upon the public highway, until reloaded. If, however, it drives the cattle, after receiving notice of their diseased condition, upon the public highway, it does so at its own peril, and is liable, under the statute, for the damages arising by the communication of the disease or fever to domestic cattle from the cattle so diseased, provided the owners of the domestic cattle are not guilty of contributory negligence.[2]

In Wisconsin a deed of trust given by a railroad company to secure the payment of certain bonds contained a clause that, if the bonds were duly paid, the estate thereby created should cease and become void. The Supreme Court rules that it was in effect a mortgage, and that the legal title remained in the company.[3]

In Iowa the Supreme Court decides that after the collection and payment into the county treasury of taxes voted by a township in aid of a railway, the county cannot set up the defense that the railway company had sold and disposed of its property and franchises before the taxes became due, and where a tax voted by townships in aid of railways was collected, placed in the general county funds, was expended in paying the ordinary county indebtedness, and lost its identity as a railroad aid fund, the county is liable for the amount to the assignee of the railroad companies.[4]

In North Carolina the Supreme Court holds that the state statute by which the county taxes, levied upon property and franchises of a railroad in a certain township, in aid of the construction of which railroad the township had voted its bonds, were to be applied to payment of interest on such bonds, not interfering with the levy of taxes, and only directing the application of county revenue, is not void for conflict with the constitution of the state.[5]

In Louisiana, the United States Circuit Court holds that a railroad authorized to borrow money for construction purposes may mortgage such property as it may acquire in the future, and as soon as the property is acquired the mortgage operates on it. The property need not be specifically described in the mortgage, as this in most cases would be impossible.[6]

In South Carolina a statute empowered counties through which a railroad was authorized to construct its road to issue bonds at 6 per cent., payable in 30 years, in subscription for preferred stock of the company, bearing interest at 7 per cent., and to deliver the same to the company when the latter commenced the construction of its road within the county, and deposited with the county treasurer a bond to secure the payment of the interest on such bonds until the road should be completed in the county; at which time preferred stock, to the amount of such bonds, was to be received by the county commissioners. The Supreme Court decides that the railroad was not liable under such act, or the bond given in pursuance of it, for the payment of interest on the bonds of the county after the county received and became entitled to interest on its preferred stock, although such stock was received before the completion of the road. The Court also holds that where a county has received stock of a railroad which, by the legislative enactment, authorizing it to subscribe therefor, it was to receive after the completion of the road within the county, and until the receipt of which it was entitled to have the interest on its bonds issued therefor paid by the company, it will be estopped, in an action to recover such interest to set up that the road has not been completed. In the same case it is ruled that where stock of a railroad was to be received by the county commissioners on the completion of the road within the county, who received it before the road was completed to the terminus originally proposed, the county, having retained and accepted the benefit of such stock, will be estopped to allege against the company that the act of the commissioners in receiving the stock was *ultra vires.*[7]

In Texas the Supreme Court rules that where the road-master of a railroad furnished supplies for a boarding train under an arrangement with the plaintiff to board the railroad's men at a stipulated price, which was to be deducted at the end of each month from their wages, the railroad is not liable for money to the plaintiff when it had paid such money, upon the road-master's order, for such supplies, notwithstanding a portion of the supplies were furnished after the road-master had been superseded; the plaintiff accepting the goods, knowing them to have been shipped upon the credit of the road-master.[8]

In Iowa it is held that the president of a railway company has no power, by virtue of his office merely, to let a contract on behalf of the company for the construction of its road.[9]

In Nebraska the Supreme Court rules that the right of a railroad to condemn buildings situated on real estate necessary for its use is an incident to such right to condemn, and the owner must be paid full value for the land and the building.[10]

A Wisconsin statute extended for three years the time during which the lands of the Wisconsin Central Railroad Co. should be exempt from taxation, the original period of exemption being ten years from Jan. 1, 1866. The Supreme Court holds that the period of exemption related back to the expiration of the former period of exemption, and did not commence at the date of the act, and that the lands were taxable in 1879. The Court in this case also decides that by the location and completion of the road, according to all the requirements of the granting act, the Wisconsin Central Railroad Co. secured an equitable right to all the lands granted to it, and, upon such completion, such equitable rights attached, although the patent had not been issued to the company.[11]

In Texas it is held that where railroad ties were rotten at the place where a derailment took place, and a train which had previously passed over had caused the rails to spread, this shows negligence in the railroad. In such case, the spreading of the rails caused by the passage of the first train was the proximate cause of the accident, and the defendant cannot avoid its liability by showing that the employés on the first train were guilty of negligence in not giving warning of the condition of the track in time to prevent the accident.[12]

In Texas, in an action for injuries to an employé, alleged to have been caused by an unsafe car, it appeared that the plaintiff had received the injury while attempting to board a moving train. The Supreme Court decides that, as plaintiff was injured while disobeying a known and reasonable rule of the company provided for his safety, he could not recover.[13]

In Virginia a former fireman of a railroad accepted an invitation by one of its engineers to ride on the engine with him. The conductor saw him on the engine and spoke to him there. He neither paid any fare, nor had any demanded of him. The rules of the company, which every employé was required to learn, prohibited any one but the engineer and certain employés from riding on the engine. The Supreme Court of Appeals holds that he was charged with notice of such rule; that he could derive no authority from the engineer or conductor for his act; and that he was a mere trespasser, and cannot recover for injuries sustained.[14]

In Louisiana the Federal Court orders the receivers of a railroad to pay the wages of a switchman who was injured in its service during the time of his sickness, although it, the road, was not legally liable to the man for the injuries. "The Court," says the Judge, "deems it just and good policy for the receivers to pay wages during recovery from injuries received in the line of duty when undue carelessness of the employé did not contribute to the injury."[15]

In Missouri a railroad train, running through a street faster than allowed by ordinance, overturned a woman's wagon, and injured her. She had been warned by the flagman that the train was coming, and had driven off and waited 10 minutes in a house near by for the train to pass. When she returned, it was after train-time, and neither train nor flagman was in sight. When she first discovered the train, she was going towards it, and there was barely room for her wagon between the track and the curb-stone. She turned her horse, and tried to drive across the track into an alley about 30 feet away, the nearest point of safety. The train was then far enough away to be stopped before reaching her. She might, by driving towards the train have reached a place of safety without crossing the track. The Supreme Court rules that this does not show contributory negligence on her part, and she is entitled to damages.[16]

In Mississippi the Supreme Court decides that the section of the code of that state prohibiting locomotives and cars from being run through towns, cities and villages at a greater rate of speed than six miles an hour, does not make a railroad company liable for injury done by an engine running in violation of the statute, to a person who walks on

the track and upon a trestle without looking or listening for moving engines, if the evidence fails to show that the company's servants saw such person b fore the accident.[17]

In Illinois the Supreme Court rules that where the plaintiff was injured while crossing the defendant's railroad in a carriage, owing to the neglect of the defendant to sound the whistle or ring the bell on approaching the crossing, which was in constant public use, the plaintiff's view being obstructed by buildings, the question whether the statute requiring signals to be given on approaching a highway applied to the crossing at which the injury occurred is immaterial. In view of the circumstances, it was the duty of the defendant to operate its trains at a moderate rate of speed, and to give the usual signal of its approach, without regard to the statute.[18]

In Pennsylvania the Supreme Court reiterates the rule that a man who walks or drives across a railroad track without stopping to "look and listen" for approaching trains is without remedy if he is injured.[19]

In Massachusetts the Supreme Judicial Court says that railroads have the right to exclusive use of grade crossings when their trains are passing, and it is their duty to give suitable warning of such passing trains to travelers upon the highway. But where a traveler, diregarding a suitable warning from a railroad company that its train is about crossing a highway, insists upon crossing the track, without sufficien t excuse, he does so at his own risk.[20]

1 Cinn., H. & I. R. Co. v. Clifford, 13 West. Rep., 384.
2 Mo. Pac. R. Co. v. Finley, 16 Pac. Rep., 951.
3 Wis. Cent. R. Co. v. Land Co., 36 N. W. Rep., 837.
4 Merrell v. Co. of Marshall, 36 N. W. Rep., 778.
5 Brown v Co. of Hertford, 5 S. E. Rep., 178.
6 Parker v. N. O., B. R & V. R. Co., 33 Fed. Rep., 693.
7 County of Lancaster v. Cheraw & C. R. Co., 5 S. E. Rep., 338.
8 Hereford v. South. Pac. R. Co., 7 S. W. Rep., 218.
9 Griffith v. C B & P. R. Co., 36 N. W. Rep., 901.
10 Forney v. F. E. & M. V. R. Co., 36 N. W. Rep., 806.
11 Wis. Cent. R. Co. v. Comstock, 36 N. W. Rep., 843.
12 Gulf, C. & S. F. R. Co. v. Pettis, 7 S. W. Rep., 94.
13 Gulf, W. T. & P. R. Co. v. Ryan, S. W. Rep., 83.
14 Virginia M. R. Co. v. Roach, 5 S. E. Rep., 175.
15 Mo. Pac. R. Co. v. Tex. Pac. R. Co., 33 Fed. Rep., 701.
16 Nuer v. Mo Pac. R. Co., 6 S. W Rep., 695.
17 Strong v. C., A. & N. R. Co., 3 South Rep., 465.
18 C. & N. R. Co. v. Dillon, 13 West Rep., 286.
19 Allen v. Penn. R Co., 11 Cent. Rep., 507.
20 Granger v. B. & A. R. Co., 5 N. Eng. Rep., 821.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Delaware & Bound Brook, quarterly, 2 per cent, payable May 16.

Cleveland & Pittsburgh, quarterly, 1¾ per cent., payable June 1.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The American Society of Civil Engineers will hold its annual convention in Milwaukee, Wis., the last week of June.

The *Ohio Institute of Mining Engineers* will hold its summer meeting at Logan, O., commencing July 11.

The *International Association of Car Accountants* will hold its annual meeting in Montreal, Can., June 19.

The *American Institute of Mining Engineers* will hold its fifty-first meeting at Birmingham, Ala., commencing May 15.

The *American Train Dispatchers' Association* will hold its fifth annual meeting at Louisville, Ky., June 12.

The *National Association of General Passenger and Ticket Agents* will hold its fall meeting in Saratoga, N. Y., Sept. 18.

The *National Association of General Baggage Agents* will hold its next meeting in New York City July 18.

The *Master Car-Builders' Association*, annual convention, Alexandria Bay, N. Y., commencing June 12.

The *American Railway Master Mechanics' Association*, next annual convention, Thousand Islands, N. Y., June 19.

The *New England Railroad Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, on the third Thursday of each month.

The *Western Railway Club* meets in Chicago the third Wednesday in each month.

The *Central Railway Club* meets at the Tifft House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *American Society of Civil Engineers* holds meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, N. Y.

The *Boston Society of Civil Engineers* holds its regular monthly meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday of each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

The *Engineers' Club of St. Louis* meets the first and third Wednesday of each month till June.

The *Engineers' Society of Western Pennsylvania* meets in Pittsburgh the third Tuesday of each month.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Brooklyn & Montauk, special meeting, 120 Broadway, New York, June 11.

Burlington, Cedar Rapids & Northern, annual meeting, Cedar Rapids, Ia., May 22.

Canada Southern, annual meeting, St. Thomas, Ont., June 6.

Chicago & Eastern Illinois, annual meeting, Chicago, Ill., June 6.

Chicago, Milwaukee & St. Paul, annual meeting, Milwaukee, Wis., June 2.

Chicago & Northwestern, annual meeting, at the office in Chicago, Ill., June 7.

Chicago, Rock Island & Pacific, annual meeting, Chicago, Ill., June 6.

Chicago, St. Paul, Minneapolis & Omaha, annual meeting, Hudson, Wis., June 9.

Denver & Rio Grande, annual meeting, Denver, Col., May 22.

Des Moines & Fort Dodge, annual meeting, Des Moines, Ia., June 7.

Kentucky Union, special meeting, Louisville, Ky., May 21.

Middletown, Unionville & Water Gap, annual meeting, 15 Cortlandt street, New York City, May 28.

Milwaukee, Lake Shore & Western, annual meeting, Milwaukee, Wis., June 13.

Oregon & Transcontinental, annual meeting, Portland, Or., June 18.

Pittsburgh, Fort Wayne & Chicago, annual meeting, Pittsburgh, Pa., May 16; special meeting, June 13.

Richmond & Danville, special meeting, Richmond, Va., May 21.

St. Joseph & Grand Island, annual meeting, Elwood, Kan., June 12.

St. Louis Alton & Terre Haute, annual meeting St. Louis, Mo., June 4.

St. Paul & Duluth, annual meeting, St. Paul, Minn., June 18.

Claim Agents' Association.

The Claim Agents' Association of the Middle and Southern States held its annual meeting at Old Point Comfort, Va., on May 10. The following companies are represented in this association: New York & New England; Lehigh Valley; New York, Lake Erie & Western; Delaware, Lackawanna & Western; Richmond, Fredericksburg & Potomac; New York, Philadelphia & Norfolk; Norfolk Southern; Philadelphia & Reading; Richmond & Allegheny; Norfolk & Western; Piedmont Air Line; Seaboard Air Line; Atlantic Coast Line; Chesapeake & Ohio; Shenandoah Valley; Cumberland Valley; Baltimore & Ohio; Pennsylvania; Northern Central; Philadelphia, Wilmington & Baltimore; West Jersey; Camden & Atlantic; Alexandria & Fredericksburg.

A permanent organization was effected, and a constitution and by-laws were adopted. The name of the association was changed to "The Claim Agents' Association of the Eastern, Middle and Southern States."

E. D. Hotchkiss, General Freight Agent of the Chesapeake & Ohio, was elected President, and Frank D. Howell, Claim Agent of the Pennsylvania, Vice-President, for the ensuing year. F. B. Goodall, of the Pennsylvania, was elected Secretary.

This association is only a year old, but its promoters have received assurances of considerable interest from many important roads, and they hope to make it of great benefit to both shippers and carriers.

The next meeting will be held at Niagara Falls, Aug. 2, next.

Master Car-Builders' Association.

The Trunk Line Association—*outside of the State of New York*—the Central Traffic Association and the Southern Passenger Association have agreed that persons who attend the Master Car-Builders' Convention, from points within the territory covered by these associations (excepting the state of New York), who pay full fare going to the meeting, shall be returned at one-third the highest limited rate on the above respective associations' certificates.

Blank certificates will be furnished on application to the Secretary of the Master Car-Builders' Association to persons in the New England states, Pennsylvania and Maryland. Persons outside of these states, and outside of New York state, can get certificates from ticket agents at points where tickets are purchased. Certificates will be furnished by the Secretary to parties in the New England states, Pennsylvania and Maryland, on and after June 1.

Persons who attend the convention from points outside the state of New York, to avail themselves of the concession, must pay full first-class fare going to the meeting, and get a blank certificate to that effect filled in on one side *by the agent of whom they buy their tickets*. They must present this certificate to the proper officer of the Master Car-Builders' Convention at Alexandria Bay for indorsement.

It will be absolutely necessary for each person to obtain a certificate and the signature thereto of the agent of whom the ticket is purchased, to the point where the convention is held, otherwise the purchaser of a ticket will be unable to obtain the excursion rate returning, and will be obliged to pay full fare both ways. No refund of fares will be made on any account whatever, because of failure of the parties to obtain certificates.

Persons who attend the convention from points within the state of New York can get excursion tickets from ticket agents for fare and a third without a certificate. Sales will begin on Saturday, June 9, and the tickets will be available for return passage until Monday, June 25, inclusive.

Western Society of Engineers.

A regular meeting was held May 9. A communication was received from T. J. Nicholl, Vice-President and General Manager Natchez, Jackson & Columbus Railroad, accompanied by a letter from the Pennsylvania Steel Co., advocating the use of rails 33⅓ ft. long as standard. The committee on highway bridges made a report March 9 recommending that the governor of each state appoint an inspecting engineer for existing bridges, with authority to condemn unsafe structures, and to act as expert advisor to the legislature with regard to new bridges. It is further recommended as desirable that engineers should agree upon a scale of minimum rates for specifications, plans, forms of contract for city and county bridges. It is now also recommended that the secretary of the society put himself in communication with other local engineering societies with a view to getting expressions of opinion on this subject. The report was referred back to the committee, awaiting correspondence with other societies.

Engineers' Club of Kansas City.

A regular meeting was held May 7. The following were elected members: Daniel Bontecou, O. B. Gunn, E. I. Farnsworth, Alexander Potter, M. N. Wells, William B. Upton, and as associated members, H. F. Hill and F. C. Florence. Communications were read describing some piers and abutments of recently erected bridges in Montgomery County, Kan., which had failed, or were considered unsafe. Mr. Mason made some remarks on the Kansas City pavements, describing especially the Trinidad asphalt pavements

American Society of Civil Engineers—Annual Convention, Milwaukee, Wis., June, 1888.

The date of the Convention of 1888 at Milwaukee, Wis., will be the last week in June. Arrangements as to transportation are in progress with the passenger associations and committees, whereby it is expected that a rate of one and one-third full fare will be made for the round trip from all points on the lines of the roads represented by such association.

Members are invited to contribute papers or discussions on papers already published. A concise abstract of any paper to be presented should be sent to the Secretary not later than May 31. A copy of the abstract will be sent to members who may be expected to contribute discussion.

The Secretary should be advised of intention to contribute a paper or discussion on special subject.

PERSONAL.

—N. S. Hill has resigned his position as Purchasing Agent of the Baltimore & Ohio.

—A. McCollister, General Soliciting Agent of the Alabama Great Southern, with headquarters in Birmingham, Ala., has resigned, to take effect June 1.

—Mr. Fred Paine, who has been connected with the Boston & Providence at Mansfield, Mass., since 1843, and who has been station agent at that place for 29 years, retired from the service of the company on the consolidation of his station with that of the Old Colony.

—Mr. Jacob Johann, Superintendent of Motive Power of the Texas & Pacific, has tendered his resignation, to take effect June 1. Mr. Johann is one of the best known and most highly respected Master Mechanics in the country, having been connected with the Missouri Pacific, Chicago & Canada Southern, Wabash, St. Louis & Pacific, Chicago & Atlantic and other roads. For twelve years previous to entering the railroad service Mr Johann was connected with various locomotive works. He has always taken a prominent part in the proceedings of the Master Mechanics' Association, and declined a nomination as President at the last Convention.

—James Gillet, editor of the *National Car and Locomotive Builder*, died May 13, 1888, having been in quite delicate health for some years. Mr. Gillet was a man of many charming traits of character, and was highly esteemed by all who knew him well. He was of the Swedenborgian faith, and his favorite recreation was the study of the writings of Swedenborg and his followers, in which literature he was deeply versed. He may fairly be said to have been learned also in theology and mental philosophy. He was a man of the greatest rectitude of character, and most punctilious in all his business and social relations. Few men have such scrupulous regard for the rights and feelings of others as Mr. Gillet always observed. Some months before his death he wrote the following brief memorandum of his life. It is a very simple and modest record, but Mr. Gillet was a very single-minded and modest man:

I was born at Columbus, O., June 17, 1818. My father and mother went from Connecticut a few years previous and settled in Columbus, which was then a small village. In 1823, when I was five years old, my father and mother, myself and one older brother (all the family) came to Connecticut on a visit to relatives, expecting to return to Ohio in about 4 weeks, but both my mother and father were taken sick with fever and died within 48 hours.

I remained with relatives in Connecticut till 1839, working part of the time on a farm and going to school, and afterward served an apprenticeship of 4 years in a country store in Newton, Conn.

On returning to Columbus, I was a clerk in a store for a while, then entered the office of the *Ohio State Journal* as a bookkeeper, and also reported for that paper the proceedings of one House of the Ohio Legislature (sometimes one and sometimes the other) for four successive winters. I was subsequently connected with the editorial department of that paper, and in 1845 was chosen Secretary of the Board of Control of the then State Bank of Ohio, in which position I remained three years, when in consequence of ill health I had to seek a less bilious climate. I spent a year or more in Vermont and then went to Europe, where I remained six months. I then came home and went to Florida, where I remained for six consecutive winters, partly in the banking and partly in the cotton business. Then came to Brooklyn and engaged in the lumber business, and afterward entered the office of Vose, Dinsmore & Co., who started the *National Car Builder* in 1870, of which I was sole editor until about 1884.

ELECTIONS AND APPOINTMENTS.

Alameda County.—The directors of this new California company are as follows: J. H. Woodward, W. E. Hale, E. E. Ames, C. C. Clay and R. W. Snow. President, J. H. Woodward; Secretary, R. W. Scott; Treasurer pro tem., C. H. Ramsden.

Atchison, Topeka & Santa Fe.—At the annual meeting held at Topeka, Kan., May 10, the directors were re-elected as follows: William B. Strong, I. T. Burr, B. P. Cheney, C. B. Coleman, C. K. Holliday, A. W. Nickerson, E. B. Purcell, Warren Sawyer, George Sealey, L. Severy, George O. Shattuck, Alden Speare, and W. F. Wharton. The following officers were elected: William B. Strong, President; C. W. Smith, First Vice-President: A. A. Robinson, Second Vice-President; J. F. Goddard, Third Vice-President; George B. Peck, General Solicitor; George W. McCreary, General Council; E. Wilder, Secretary and Treasurer; George L. Goodwin, Assistant Secretary and Assistant Treasurer; John P. Whitehead, Controller and General Auditor, and Alfred A. Glassier, Transfer Agent. The following appointments and changes in headquarters have been made, taking effect June 1. The headquarters of C. W. Smith, First Vice-President, will be at Boston. George R. Peck is General Solicitor, with headquarters at Topeka, Kan. The several Claim Departments are transferred to the Legal Department. A. A. Robinson, as Second Vice-President and Manager, will in addition to his present duties take charge of the Operating Department of the Atchison, Topeka & Santa Fe, Southern Kansas, and Chicago, Kansas & Western lines, with office at Topeka, Kan. As to all matters in the Construction Department he will report to the President, and upon all matters pertaining to the Operating Department he will report to the First Vice-President. W. Snyder as Second Vice-President and Manager of the Gulf, Colorado & Santa Fe, headquarters at Galveston, Tex., will have charge of the operating and construction departments of that line. J. F. Goddard has been elected Third Vice-President, with office at Chicago, Ill. He will have charge of the traffic of the entire Atchison system (including express business), covering all lines owned, leased, operated or controlled by the Atchison, Topeka & Santa Fe, and the several traffic managers will report to him. Mr. Goddard has also been appointed Manager of the Chicago, Santa Fe & California Railway, with office as above. He will report to the first vice-president.

Camden & Burlington County.—The following Directors were elected at the annual meeting at Mt. Holly, N. J., May 12: John S. Irick, Richard C. Shreve, Richard Ashhurst, W. H. Gatzmer, Edmund Smith, J. N. Du Barry, Clifford Stanly Sims, W. Budd Deacon, John C. Sims, Jr., W. Hassel Wilson, William J. Sewell, William N. Bannard, William S. Taylor, Joseph H. Gaskill, Charles E. Hendrickson.

Canton & Waynesburg.—At the annual meeting last week the following officers and directors were elected: President, Louis Schaefer, Canton; Secretary and Treasurer, Charles H. Blood, Boston; Superintendents, J. W. Wardwell, Cleveland; E. T. Blood, Boston; R. W. Wakehouse, H. A. Kennedy and C. C. Cook, Canton.

Central of Georgia.—D. W. Bowman has been appointed Consulting Engineer, in charge of bridges, with headquarters in Savannah, Ga.

Central of New Jersey.—At the annual meeting held in Jersey City, N. J., May 11, the old board of directors were elected.

Central Valley.—The following are the officers and directors of this company: Dr. A. T. Keightley, President, Greencastle, Ind.; L. A. Weakly, Vice-President, Shelbyville, Ky.; William Daggy, Secretary, Danville, Ind.; J. W. Lee, Assistant Secretary, Bedford, Ky.; J. D. Shouse, Treasurer, Sulphur, Ky.; J. R. Cronin, Madison Ind.; W. H. McElvaine, Sulphur, Ky.

Cheshire.—At the annual meeting held at Keene, N. H., May 9, the following Board of Directors was elected: W. A. Russell, E. C. Thayer, G. W. Russell, A. B. Turner, R. M. Pulsifer, W. H. Hill, Jr., and H. W. Suter.

Chicago, Burlington & Quincy.—The old board of directors were re-elected at the annual meeting held in Chicago, May 16.

F. C. Rice has been appointed Superintendent of the Illinois Division, with headquarters at Galesburg, vice C. C. Upham, resigned. A. F. Hilton has been appointed Superintendent of the Galesburg Division, with headquarters in Galesburg, in place of F. C. Rice, promoted.

Chicago, Milwaukee & St. Paul.—W. J. Underwood has been appointed Superintendent of the Chippewa Valley & Wabasha Division in place of J. H. Lakey, resigned. C. A. Goodnow is appointed Superintendent of the Dubuque Division, with headquarters at Dubuque, in place of W. J. Underwood, transferred. E. W. Hadley has been appointed Superintendent of the James River Division, with office at Aberdeen, D. T., vice C. A. Goodnow, transferred, and Wilburt Irwin has been appointed Superintendent of the Hastings & Dakota Division, with office in Minneapolis, Minn., vice W. M. Kellie, resigned.

The Immigration Department is now a Bureau of the General Passenger Department, and W. E. Powell has been appointed General Immigration Agent, with office in Milwaukee.

W. A. McWhinney has been appointed Traveling Passenger Agent, with headquarters at Cleveland, Ohio, vice F. G. Boyd, resigned.

Claim Agents' Association of the Eastern, Middle and Southern States.—The officers of this association are: E. D. Hotchkiss, President, Richmond, Va.; F. D. Howell, Vice-President, Philadelphia, Pa.; F. B. Goodall, Secretary, Philadelphia.

Cleveland & Canton.—At the annual meeting held at Canton, O., May 10, the following directors were elected: H. A. Blood, Fitchburg; W. J. Rotch, New Bedford, Mass.; George N. Smalley, W. O. Chapman, W. Rotch, Boston; W. E. Coffin, New York; Albert Van Wagener, H. C. Ranney, W. Edwards, E. S. Flint, A. S. Emery, and S. T. Paine, Cleveland; Louis Schaefer, Canton; D. H. Taylor, Carrollton, and Samuel Allen, Deli Roy, O. The directors elected H. A. Blood, President; W. O. Chapman, Vice-President and Treasurer, and D. K. Stevens, Secretary.

Cleveland, Lorain & Wheeling.—At the annual meeting in Cleveland, May 10, the following Directors were elected: Selah Chamberlain, W. S. Streator, E. P. Pitkins, Oscar Townsend and C. L. Cutter, of Cleveland; John Newell, of Chicago, and H. A. Kent, of New York.

Delaware & Hudson Canal.—At the annual meeting held at the office of the company, in New York, May 8, the following were elected managers for the ensuing year: Abiel A. Low, Le Grand B. Cannon, James R. Taylor, John Jacob Astor, James Roosevelt, Abraham R. Van Nest, David Dows, Robert M. Olyphant, Benjamin H. Bristow, John A. Stewart, Frederick Billings, R. Suydam Grant, William H. Tillinghast. The Board of Managers re elected Robert M. Olyphant President.

Eastern Railroad Association.—At a meeting held May 9 the following officers were re-elected: W. D. Bishop, President; Theodore N. Ely, Vice-President; A. A. Folsom, Treasurer; A. McCallum, General Counsel; J. J. Harrower, Secretary.

Eau Claire, Mississippi & Lake Superior.—The incorporators of this Wisconsin company are as follows: R. F. Wilson, George A. Buffington, William A. Rust, G. B. Shaw, H. M. Stocking and Henry Cousins, of Eau Claire.

Indianapolis, Springfield & Western.—H. P. Hammond has been chosen President of the reorganized company, with office in Indianapolis, Ind.

Kansas City Belt.—At the annual meeting held in Kansas City, Mo., the following board of directors was elected: George H. Nettleton, Roswell Miller, C. W. Smith, J. T. Goddard, E. Wilder, Wallace Pratt and Watson J. Ferry. The directors met and organized by electing George H. Nettlewood, President; E. Wilder, Treasurer; and Watson J. Ferry, Secretary.

Keokuk & Western.—Joseph Bennett has been appointed Auditor, Assistant Treasurer and Paymaster.

Long Beach.—At the annual meeting held in Camden, N. J., last week the following directors and officers were elected: Directors, E. Smith, W. J. Sewell, George M. Dorrance, William Bettle, W. N. Bannard, R. B. Gowdy, B. F. Archer, W. T. Bailey, D. E. Culver, C. S. Ridgway, J. N. Du Barry, H. D. Welsh, J. P. Wetherill. President, W. J. Sewell; Secretary and Treasurer, William Taylor.

Louisville, Evansville & St. Louis.—At the annual meeting last week the following directors were elected: William T. Hart, J. H. Lee, John Goldthwait, N. W. Bumstead, Jacob Edwards, H. C. Harden and Isaac Fenno, of Boston; Alexander P. Humphrey, St. John Boyle and James M. Fette, of Louisville, and Thomas W. Scott, of Fairfield.

Louisiana & Missouri River.—At the annual meeting held at St. Louis last week, the following directors were elected: Arthur Lee, John J. Mitchell, William H. Bliss, R. P. Tansey, Eleneious Smith, St. Louis; Arthur B. Silsbee, Henry Cabet Lodge, Boston. The following officers were elected: William H. Bliss, President; R. P. Tansey, Vice-President; Charles H. Foster, Secretary and Treasurer; F. A. Wann, Assistant Secretary.

Louisville, New Albany & Chicago.—F. G. McCurdy has been appointed Superintendent of Telegraph, vice W. B. Jones, resigned.

Louisville Southern.—A. V. LaFayette has been appointed General freight and Passenger Agent, with office in Louisville, Ky.

Missisquoi Valley.—The following officers and directors were elected at the annual meeting in Montreal May 9: President, John H. Graham, Richmond; Vice-President, Edward C. Smith, St. Albans; Secretary, L. B. Futvoye, St. Johns; Thomas Hart, Richmond; George Williamson, Kingsbury; David A. Manson, Mansonville; Hon. J. Gregory Smith, J. W. Hobart, and George T. Childs, St. Albans.

Mississippi River & Bonne Terre.—The incorporators of this Missouri company are as follows: J. Wyman Jones, of Englewood, N. J. C. B. Parsons, Gustave Setz and James B. Wilde, of Bonne Terre, Mo., and Fayette C. Graves, of Doe Run, Mo.

Missouri, Kansas & Texas.—The following directors were elected at the annual meeting held in Parsons, Kan., May 16: E. Ellery Anderson, W. L. Buell, R. V. Martinsen, W. Mertens, Henry K. Enos, J. Denville, W. Dowd, Samuel Sloan, George J. Forrest, Simon Sterne and W. Bond, of New York; James C. Thompson, of Sedalia, Mo.; David Kelso, of Parsons, Kan.; B. P. McDonald, of Fort Scott, Kan.; H. C. Cross, of Emporia, Kan.; and William S. Haradon, of Tyler, Tex.

Mobile & Birmingham.—W. O. MacMahon has been appointed Superintendent, with headquarters at Mobile, Ala. He will also perform the duties of General Freight and Ticket Agent.

Monticello, Fallsburgh & New York.—The trustees of this New York company are: Thornton A. Niven, George E Bennett, Le Grand Morris, P. R. Pelton, J. F. Tymerson, A. A. Crain, A. M. Fulton, S. L. Strong, L. C. Hatch, C. S. Starr, T. F. Bush, George H. Bullard and M. H. Couch, all of Monticello.

Mount Washington.—At the annual meeting held at Concord, N. H., May 9, the following directors were elected: Walter Aiken, James T. Furber, C. E. A. Bartlett, Nathaniel White, Jr., Frederick Smythe, John M. Mitchell and John P. George. Walter Aiken was chosen President, E. D. Harlow Treasurer and F. E. Brown Secretary.

New York & Harlem.—The following board of directors was elected at the annual meeting in New York City May 15: Cornelius Vanderbilt, William K. Vanderbilt, Frederick W. Vanderbilt, Daniel F. Barber, John D. Dutcher, Chauncey M. Depew, John E. Burrill, William H. Leonard, Charles C. Clarke, Joseph Harker, Francis P. Freeman, Samuel D. Babcock and Alfred Van Santvoord.

Ohio, Indiana & Missouri River.—The first board of directors of this company is as follows: John K. Brice, C. N. Haskell and W. A. Armstrong, of Toledo, Ohio, and who are also officers of the New York, Mahoning & Western; W. B. Sterrett and A. J. Baldwin, of Pennsylvania, and George J. Sherman and George Dempster.

Oroville & Beckwith.—The following are the directors of this new California company: J. E. Doolittle, W. D. Woodbury, N. W. Griswold, C. M. Oakley and A. G. Sheath.

Paris, Marshall & Sabine Pass.—The following have been elected officers of the reorganized company: D. H. Scott, President; Jno. Martin, First Vice-President, Paris, Tex.; W. W. Heartsill, Second Vice-President and General Manager: E. J. Fry, Secretary and Treasurer; H. W. Lloyd, Superintendent, Marshall. The general office is in Paris.

Portland & Vancouver.—The following are the officers of the company: Frank Dekum, President; John R. Wheat, Vice-President and Manager; George H. Durham, Secretary, and R. L. Durham, Treasurer. The general office is in Portland, Or.

St. Joseph, St. Louis & Santa Fe.—At the annual meeting of this company, which is part of the system of the Atchison, Topeka & Santa Fe, the following directors were elected: W. A. P. McDonald, Isaac T. Hosea, John S. Leman, W. D. B. Motter, E. L. Marney, C. A. Shoup, R. E. Turner, Winslow Judson, Daniel Crosby, B. M. Curtis, T. J. Killam, P. G. Noel and W. B. Strong. The directors elected the following officers: President, Winslow Judson; First Vice-President, C. W. Smith; Second Vice-President and Chief Engineer, A. A. Robinson; Third Vice-President, B. Goddard; Secretary, Edward Wilder; Assistant Secretary, Charles S. Tuckerman; Treasurer, Edward Wilder.

St. Louis, Kansas City & Colorado.—At the annual meeting in Fort Scott, Kan., the following Board of Directors was elected: George O. Manchester, A. D. Devins, C. H. Draper, A. B. Laurie, Boston; C. H. Osbun, Fort Scott; J. A. Sturgeon, Geo. W. Kimball, St. Louis; J. C. Carpenter, Chanute. The directors elected the following officers: G. O. Manchester, Boston, President; John Gallup, Jr., St. Louis, Secretary and Treasurer; G. L. Goodwin, Boston, Assistant Secretary and Treasurer.

St. Louis & San Francisco.—At the annual election, held in St. Louis, May 9, the following directors were re-elected: William F. Buckley, George Coppell, I. E. Gates, George J. Gould, Ryce Gray, C. P. Huntington, Horace Porter, John Paton, Jesse Seligman, Russell Sage and Edward F. Winslow, of New York; Walter L. Frost, of Boston, and John O'Day, of St. Louis.

Santa Ana & Tustin Motor.—The directors of this new California company are: James McFadden, C. W. Humphreys, Geo. W. Minter, J. N. Smith, W. S. Bartlett.

Seaboard & Roanoke.—At the annual meeting in Portsmouth, Va., last week, the following officers and directors were elected: John M. Robinson, President and General Superintendent, and Enoch Pratt, Louis McLane, R. C. Hoffman, Baltimore; D. A. Barnes, Murfreesboro, N. C.; Moncure Robinson, Jr., Philadelphia, Pa., and Richard Dickson, Norfolk, Va.

Soo & Southwestern.—The following are the incorporators and first board of directors of this company: James McIntyre and W. A. Rust, of Eau Claire, N. C., and E. J. Foster, of Fairchild, and R. M. Foster, of Williamsport, Pa.

Texas Trunk.—The following board of directors was re-elected at the annual meeting in Dallas, Tex., May 5: John L. Henry, J. E. Schneider, T. L. Marsalis, A. Sanger, W. N. Wingley, Philadelphia; F. L. Ross, New York; John L. Henry, W. G. Moury, Dallas. The following officers were elected: John L. Henry, President; J. E. Schneider, Vice-President; W. G. Moury, General Manager and Treasurer; J. F. Gilbrough, Secretary.

Union Pacific.—W. A. Duel, Superintendent of the Eastern Division, in Nebraska, has been transferred to the Western end of the Wyoming, between Ogden and Green River, with headquarters at Evanston.

Utah Central.—At the annual meeting held in Salt Lake City, May 7, the following directors were elected: Charles Francis Adams and F. L. Ames, of Boston; Henry McFarland and Sidney Dillon, of New York; H. C. Hill, Hoyt Sherman, Jr., John Sharp, H. S. Eldredge and James Sharp, Salt Lake City.

Utica, Adirondack & Saratoga.—The following are incorporators of this New York company: Richard W. Sherman, Edward Norris and Henry C. Ballou, of Utica; Michael McDonough, of West Troy; William T. Finch, of Northwood.

Vicksburg, Canton & Yazoo City.—The following directors were elected under the amended charter: John R. Cameron, J. J. Cowan, Warren Cowan, W. G. Paxton, H. C. McCabe, W. A. Baldwin, George Anderson, A. M. Paxton, Jr. The directors then elected J. J. Cowan as President; John Cameron, Vice-President; W. G. Paxton, Secretary and Treasurer.

Vicksburg & Meridian.—At the annual meeting the old Board of Directors were re-elected, and they re-elected President Charles Schiff, and Vice-President C. C. Harvey.

Virginia, North Carolina, Tennessee & Western.—The following are the incorporators of the company: Thomas Breen, Pennsylvania; G. H. Wand, John L. Douglas, Hiram Barnay, Edward Wells, New York; Thomas V. Cooper, Pennsylvania; John J. Wade, Baltimore; Peter Mundy, Pennsylvania; Roderick R. Butler, Mountain City, Tenn.; E. O. Steeves, New York; G. W. Corlin, Nashville,

Washington, Western & Southern.—F. J. Kimball has been elected President and A. J. Hemphill Secretary of this Virginia company.

Western Ontario.—The following are among the projectors of this Canadian road: Alex. McPherson, Montreal; John H. Ferguson, Toronto; McLeod Stewart, Ottawa.

Wilmington & Northern.—At the annual meeting, held in Birdsboro, Pa., the following Board of Directors was re-elected: George Brooke, Charles Huston, A. L. Foster, John S. Gerhard, William Dupont and L. Heber Smith. The following officers were re-elected: Col. H. Dupont, President; E. B. Shurter, Secretary; A. G. McCausland, Superintendent and Treasurer; F. L. Hills, Chief Engineer.

Zealand.—James E. Henry is President of this company, which was recently organized at Littleton, N. H.

OLD AND NEW ROADS.

New Companies Organized.—Almeda County.—Coal Creek & Beech Fork.—Eau Claire, Mississippi & Lake Superior.—Mississippi River & Bonne Terre.—Ohio, Indiana & Missouri River.—Oroville & Beckwirth.—St. Paul & Minneapolis Elevated.—Santa Ana & Tustin Motor.—Soo & Southwestern.—Utica, Adirondack & Saratoga.—Virginia, North Carolina, Tennessee & Western.

Alameda County.—Articles of incorporation filed in California to construct a road from Mills Seminary, Alameda County, westerly about five miles to San Francisco Bay, with a branch line to Oakland. The capital stock is $200,000.

Anniston & Cincinnati.—Tracklaying has now been completed to within six miles of Gadsden, Ala.

Austin & Northwestern.—About two-thirds of the grading on the extension from Burnet to Marble Falls, Tex., 16 miles, has been completed. Near Marble Falls the road passes by a large granite quarry, and from a point near there a line 36 miles long will be built to Llano, when the present extension is completed, for which F. H. Halloway is the contractor.

Baie des Chaleurs.—The road is now completed between Matapedia, on the Intercolonial, and Carleton, Que., a distance of 40 miles, and the contract for constructing the road as far as Paspebiac, 60 miles from Carleton, has been let to C. W. Armstrong, Montreal, Que. The survey for this part of the road has been completed to New Richmond, 10 miles from Carleton, and is being continued to Paspebiac. When this section of the road has been completed the second section, extending from Paspebiac to Gaspé, a distance of 80 miles, will be placed under construction. A. L. Light, Quebec, is Chief Engineer.

Boston, Concord & Montreal.—The proceedings for a receiver for the road have been discontinued and an agreement entered into by which the line is to be put in a satisfactory condition. The suit brought to contest the legality of the lease of the road to the Boston & Lowell, which the latter had transferred to the United States Circuit Court, is to be remanded to the State Supreme Court of New Hampshire, and that suit, with others involving questions raised in connection with lease, etc., are to be consolidated. This compromise disposes of the question of a receiver and places the whole subject in condition for a speedy settlement.

Brooklyn & Montauk.—A meeting of the stockholders will be held in New York City, June 11, for the purpose of authorizing the issue of $600,000 mortgage bonds, of which it is proposed to use $510,000 to replace net earnings which have been used in betterments. The directors recommend the applying of the balance to various objects, and ask the approval of their plans, and also of their action in declaring a dividend of 30 per cent. on the preferred and 20 per cent. on the common stock. The road is a part of the Long Island system.

Burlington, Cedar Rapids & Northern.—The report of the Master in Chancery to the United States Court in Iowa, in the case of the second mortgage bonds, known as the income and equipment bonds, which have been in litigation since 1875, states that of the 2,000 bonds 513 are established, and amount with interest to over $1,000,000. The 1,400 bonds known as the Lackawanna bonds are all thrown out, and the first mortgage bonds are reported to amount to over $11,000,000. The case will now be tried at Des Moines at the October term.

Cape Fear & Yadkin Valley.—The North State Improvement Co. has contracted to build the extension from Fayetteville to Wilmington at $20,000 per mile, of which $5,000 is in the capital stock of the railroad, $5,000 in second mortgage bonds, and the rest in first-mortgage bonds. Grading has been completed on the extension to Mt. Airy, N. C.

Carolina, Cumberland Gap & Chicago.—The company has been voted $53,000 by towns in Edgefield County, S. C., to aid in the construction of its road, which is projected to extend from Aiken, S. C., and Augusta, Ga., to Lexington, S. C.

Central Valley.—It is stated that arrangements are being made to commence the preliminary survey for this road, which it is proposed to build from Madison, Ind., south through Kentucky to the Tennessee state line, where connection is to be made with a road to be built from there through the states of Tennessee, Alabama and Florida. It is also proposed to extend the road north from Madison to Grantsburg, Ind., to connect with existing roads. A bridge over the Ohio is included in the plans.

Chesapeake & Ohio.—The Reorganization Committee announce that the holders of about 90 per cent. of the stock and bonds of the company, affected by the plan of reorganization, have accepted the provisions of the reorganization agreement dated Feb. 7, 1888. Outstanding securities may still be deposited with Drexel, Morgan & Co., of New York, on payment of specified penalties. Notice is also given that the third installment of 25 per cent. of the assessment on all classes of stock deposited under the agreement is called, and will be payable June 4.

Chicago & Atlantic.—An order has been entered by Judge Gresham in the foreclosure case of the Farmers' Loan & Trust Co. against the road, allowing the New York, Lake Erie & Western to file an intervening petition praying that the $584,850 first mortgage coupons of this company be recognized as valid obligations and entitled to payment ratably with other bonds. They were taken in payment of an indebtedness.

Chicago, Burlington & Quincy.—The stockholders passed a resolution at the annual meeting in Chicago, May 16, approving the course pursued by the officers in the recent strike of the engineers and firemen.

Chicago & Northwestern.—Work will soon be commenced on a passenger station to be erected at Sioux City, Ia., and which it is estimated will cost $125,000.

Coal Creek & Beech Fork.—Incorporated in Alabama to build a road from Coal Creek, Jefferson County, to

a connection with the Alabama Great Southern, by E. C. Locke, H. M. Wilson and others of Coal Creek.

Columbus & Western.—The Oak Mountain tunnel, which is about 1,200 feet long, was completed May 10, and has been cleared and leveled. The contract will soon be let for tracklaying on about three miles through the tunnel and to the Coosa Mountain tunnel, which has been cleared of the rock, although a considerable amount of work still remains to be done to complete it.

Cornwall & Lebanon.—Surveys are now being made for the extension of this road southeast from Lebanon toward Reading and Birdsboro, Pa., 28 miles, although the route has not as yet been fully decided upon nor the point to which the extension is to be made.

Covington & Macon.—Tracklaying on the extension north from Madison to Athens, Ga., about 35 miles, has been completed to a point about 4 miles from Madison.

Denver, Texas & Fort Worth.—The company is constructing a branch from Bishoar, eight miles south of Trinidad, Col., to a coal mine six miles distant. Forty-five miles of branches have been surveyed and a portion of these will be shortly placed under construction.

Dexter & Newport.—The grading on the proposed extension from Dexter northeasterly to Dover will, it is stated, begin about June 1. The road is a leased line of the Maine Central.

Dodge City, Montezuma & Trinidad.—The grading has been completed from Dodge City, Kan., westerly through Ford and Gray counties about 40 miles, and tracklaying will probably be commenced at Dodge City next week.

Duluth, Glencoe & Southwestern.—The directors of this newly incorporated Minnesota company have authorized a preliminary survey to be made from Mankato via Glencoe, Watertown, Carver, Rockford and Elk River to Duluth. An assessment of 10 per cent. on the stock has been paid in. A. H. Reed, Glencoe, Minn., is President.

Duluth, St. Cloud, Mankato & Southern.—The preliminary survey for this road is now in progress. It is projected to extend from Austin and Albert Lea, near the southern boundary of Minnesota, to St. Cloud and Duluth. John Cooper, St. Cloud, Minn., is President.

Eau Claire, Mississippi & Lake Superior.—Articles of incorporation filed in Wisconsin for the purpose of constructing a road from Winona, Minn., northerly, through Independence, Eau Claire, Chippewa Falls and then to some point on Lake Superior in Ashland County. It is intended as a lumber outlet to the Southwest from Eau Claire. The capital stock is $2,000,000.

Erie Southern.—Committees have been organized in Erie, Pa., to obtain subscriptions to the road which it is proposed to construct from Erie to a connection with the New York, Pennsylvania & Ohio.

Galveston, Sabine & St. Louis.—The road was sold in Longview, Tex., May 8, for $100,000 to C. M. Whitney & Co., of New York, representing the Purchasing Committee of the bondholders. The road is 22 miles long, extending from Longview to Tatum's, and is owned in the same interest as the Texas, Sabine Valley & Northwestern.

Georgia Pacific.—Contracts were let May 14 to J. S. McTighe & Co., Memphis, Tenn., for grading and trestling the road from Johnsonville to Greenwood, Miss., 27 miles, and to Garvey, Jones & Forrest, Memphis, Tenn., for grading and trestling from Greenwood to Winona, Miss., 28 miles.

Georgia Southern & Florida.—A survey is being made for a projected branch to Thomasville, Ga., on the Savannah, Florida & Western.

Grand Rapids & Indiana.—Efforts are being made to have the company build a branch from Levering easterly about 17 miles to Cheboygan, Mich. It is stated that a company will be organized to build the road if this company does not move in the matter. W. McArthur of Cheboygan and J. M. Turner of Lansing are among the prime movers.

Grand Rapids, Lansing & Detroit.—The grading on this road, which is being constructed by the Detroit, Lansing & Northern, from Grand Ledge, Eaton Co., Mich., westerly to Grand Rapids, a distance of 53 miles, is now nearly all completed, and 18 miles of track has also been finished. McRae & Lally, Detroit, Mich., are the contractors.

Gulf, Colorado & Santa Fe.—The locating survey for the extension from Ballinger southwest 36 miles to San Angelo, Tex., has been made, and the contracts for constructing the road will be let immediately.

Indianapolis, Chattanooga & Southern.—Incorporated in Indiana to construct a road southward from Indianapolis, Ind., passing through Johnson, Brown, Jackson, Washington, Harrison, Crawford and Perry counties. There are said to be valuable coal mines and stone quarries along the line.

Jefferson City & Southwestern.—The right of way is being secured for this road between Bagnell and Carthage, Mo., about 120 miles, which was surveyed and located last fall. The company is controlled by the Missouri Pacific. H. H. Harding is President.

Kansas City, Arkansas & New Orleans.—The locating survey is now nearing completion and contracts will be ready for letting about the middle of June. The road is to be constructed from Beebe, Ark., to Monroe, La., a distance of 250 miles. W. R. Bergholz, New York City, is the Chief Engineer.

Kansas City, Monett & Southern.—The survey has been commenced, starting from Monett, Barry County, Mo., on the St. Louis & San Francisco, and will be continued northward via Mount Vernon to Kansas City. It is supposed that the road is in the interest of the St. Louis & San Francisco. B. F. Hobart, St. Louis, Mo., is one of the directors.

Kent Northern.—A branch is being surveyed from Kingston Station to Buctouche, N. B., about 15 miles, and the contract has been let to John C. Brown, of Richibucto, the manager of the road. It is thought that construction will be commenced this year.

Kingston, Smith's Falls & Ottowa.—The company will soon commence efforts to obtain subsidies in the various towns through which the line will be built. Sir John MacDonald has stated that no Dominion subsidies would be granted the company this year, but he thought one would be eventually granted. It is estimated that the line from Kingston to Smith's Falls, 56 miles, would be $15,000 a mile.

Kit Carson, La Junta & Trinidad.—This line is projected to extend from La Junta, Col., through Arlington, Kit Carson and Culbertston, to North Platte, Neb.

Lackawanna & Pittsgurgh.—It is stated that the company has secured control, by purchase, of the old road-bed, right of way, etc., of the graded track of the Greenwood & Rexville road, in the town of Greenwood, Steuben County, New York, over which there was controversy between the taxpayers and county officials several years ago. The farmers bonded their property as a guarantee for the construction of the road, and after the company collapsed they refused to pay the same and the sheriff of Steuben County with his posse on several occasions was compelled to leave Greenwood without receiving a bid on property offered for sale. The Delaware, Lackawanna & Western will soon regrade the old track from Canisteo, which was graded from Canisteo to within 4 miles of the Lackawanna & Hornellsville. The road will be extended to Hornellsville, and also from Rexville to Coudersport, Pa., a distance of about 45 miles from Hornellsville.

Lake Shore.—A survey is being made for this road, which is to be built from Alton Bay, N. H., southeasterly to Laconia, in the interest of the Boston & Maine.

Los Angeles County.—The grading on the road from Los Angeles to Santa Monica via Sunset has now been finished with the exception of about four miles, and tracklaying will be commenced when this is completed.

Louisville Southern.—The General Council of Lexington, Ky., has accepted the proposition made by Col. Bennett H. Young, of this company, that a branch road would be constructed from Lawrenceburg easterly about 20 miles to Lexington, if bonds to the amount of $100,000 were voted to aid in the construction of the line. The Council ordered the election to be held May 24.

Lowell & Hastings.—A survey has been commenced for a proposed extension from Lowell, north via Grattan Centre to Greenville, Mich., about 18 miles, which, it is thought, will be built this year.

McKeesport & Bellevernon.—The locating survey is now being made by Taylor & Romine, of McKeesport, Pa. It is also stated that grading will be commenced next week at Reynoldton, Pa.

Mexican National.—At a recent meeting in London, of holders of Matheson & Co.'s certificates for $5,000,000 bonds, known as the Matheson bonds, of the old Mexican National Company, a resolution was adopted authorizing Messrs. Matheson & Co. to exercise the voting power for the bondholders. A resolution was also passed appointing a committee to call a meeting of all bondholders with the view of arranging a deposit of the bonds, and securing voting powers for the preservation of the rights and security of the bondholders. This is an effort on the part of Messrs. Matheson & Co. to continue the control of this road in English hands, as they have had appeals to English holders of the first mortgage bonds for their proxies in the papers for some time.

Mexican Railroads.—A concession has been granted to Lord Gosford and Colonel Norton, of the nitrate railroads of the West Coast of South America, to complete the Tehuantepec Railroad within four years, on account of the Mexican Government, which will operate it. The first concession for this road, which was granted to the late Edward Larned, of this city, and his associates, was forfeited by the Mexican Government on a technicality, as they feared to have so short an interoceanic road operated by foreigners. The concessionaires have never succeeded in getting a satisfactory settlement with the Mexican Government, but have prevented the negotiation of any bonds for it in this market, so nothing has been done with the road since the winter of 1881 and 1882.

A concession has been granted to Messrs. José Vicente, Villada & Co. to build a narrow gauge railroad in the states of Michoacan and Guerrero, starting from Zamora, passing through Uruápam to the port of Zihuatanejo, on the Pacific, with the right to build branches. A subsidy of $6,000 per kilometre, payable one-half in cash and one-half in 6 per cent. bonds, is granted. The road is to be completed within eight years.

The Mexican Government has granted a concession to Mr. H. V. Rudston Read, of the contracting firm of Bowes-Scott, Read, Campbell & Co., of London and Mexico, for a road connecting Tehuacan with Oaxaca and some port on the Pacific Ocean, in the state of Oaxaca. The length of this proposed line, which may be either standard or narrow gauge, will be over 400 miles, and after 18 months allowed for surveys, the road must be completed in 10 years, the Government guaranteeing eight per cent. interest on the capital for a term of 15 years, and for each year less than 10 years employed in construction, two years are added to the term during which interest is guaranteed, but in no case will the interest be guaranteed for over 21 years. As this road is expected to connect with the Tehuantepec Railroad, the concession seems to cover substantially the same line as that for which a concession was given to General Grant in 1880 or 1881. The line, which will traverse a rough country, will, in fact, form an extension to both the Mexican Central and the Vera Cruz roads, and bring a productive region into connection with our system of railroads.

The firm is understood to be a substantial one, backed by a London syndicate, which is thought able to furnish the $20,000,000 or $25,000,000 required to build the road.

Mississippi River & Bonne Terre.—Incorporated in Missouri to construct a standard gauge road from Bonne Terre, St. Francois County, northeasterly about 30 miles to Illinois, Jefferson County, on the St. Louis, Iron Mountain & Southern. The capital stock is $300,000.

Missouri Pacific.—Tracklaying was commenced at Boonville, Mo., last week and will be pushed westerly to the Saline County line to meet with another force working easterly from Marshall. This will complete the branch between Lexington and Boonville. Bagnall Bros. are the contractors for tracklaying.

Montana Central.—Tracklaying on the extension to Butte, Mont., 73 miles, commenced May 8, at Helena. There are 9 trestles to be built between Woodville and Butte, 5 of them being from 400 to 700 ft. long. Beyond Woodville the road is practically ready for the tracklayers. The track will be laid at the rate of 1½ to 2 miles per day.

Monterey & Tampico.—Work on the road has been commenced. Among those interested in the enterprise are President Diaz, Secretary of State Romero Rubio, Gen. Trevino and others. The company has received liberal concessions from the government. In addition to the large subsidy of land, a free right of way has been granted through the country without being compelled to pay indemnity of damages. The company, in case of war, does not have to surrender the road to the government for the time being, as is the case with other roads in the country.

Monticello, Fallsburg & New York.—Incorporated in New York to construct a six mile road from Monticello, on the New York, Lake Erie & Western, northeasterly to South Fallsburg, Sullivan County.

New York, Mahoning & Western.—Tracklaying has commenced at Ottawa, Ohio, and will be pushed east to Findlay. The contract has been let to George D. Silsby, of Findlay, and work is to be completed Jan. 1, 1890. The road is to run from Red Bank, Pa., through Findlay, O., to Fort Wayne, Ind., about 317 miles.

New Roads.—P. M. Norboe, 610 Commercial street, San Francisco, Cal., has commenced the survey for a road from Visalia, Tulare County, Cal., to extend southerly about 10 miles to a connection with the Stockton & Tulare at a point east of Tulare, on the Southern Pacific.

Norfolk & Western.—The contractors for the Clinch Valley extension, which is being constructed from Graham, on the New River Division, southwest to Norton, Wise County, Va., 106 miles, are as follows: Daniel Walton, Charlestown, W. Va.; Sexton & Houston, Roanoke, Va.; Henry Davin, Lexington, Va.; McGraun & Stewart, Lancaster, Pa.; McMahon, Green & Son, Wytheville, Va.; George T. Mills, Pulaski, Va., and Caffrode & Evans, Pottstown, Pa., are the contractors for the bridges.

Track was laid through the Mill Creek tunnel May 11. It is 3,000 feet long, and is constructed through Flat Top Mountain. Excavation was commenced May 12, 1887, making the average progress 250 ft. per month. The heading throughout the entire length of the tunnel was excavated from the Pocahontas coal bed, eight feet in thickness. The sections were enlarged by taking down the top. Henry Fairfax, Aldie, London County, Va., was the contractor.

Northern Maine.—It is stated that the surveys for this road will be commenced shortly. It is projected to extend from a point on the Maine Central to Houlton or Presque Isle. L. Powers, of Houlton, is interested.

Northern Railway Company of California.—Articles of consolidation of all the roads in Northern California owned or heretofore leased by the Southern Pacific, have been filed in California. The estimated length of the road is 700 miles, and the capital stock is $26,000,000, each share having a par value of $100.

Ohio, Indiana & Missouri River.—Articles of incorporation, filed in Indiana, to build a road from a point in Allen County, thence through Whitley, Wabash, Kosciusko, Fulton, Pulaski, Jasper and Newton counties, an estimated length of 150 miles. The capital stock is $4,000,000.

Ohio & Mississippi.—The erection of a round-house and car and machine shops will soon be commenced at Washington, Ind., where 70 acres of ground have been secured. The round-house will house 35 locomotives, and the machine shop will be 323 ft. by 94 ft., and the car shop 134 ft. by 317 ft. The buildings will be of brick, and when they are completed the present shops at Vincennes, Seymour and Corchran, Ind., will, it is said, be abandoned.

Ohio & Northwestern.—An effort is being made by citizens of Ironton, O., to have the company build its extension to Portsmouth, by way of Ironton.

Ohio Southern.—The stockholders have voted to increase the capital stock to $5,500,000, and have also authorized the funding of the equipment debt and the further issue of a first mortgage on 20 miles of new road. Of this issue $450,000 is for new equipment, $309,394 for outstanding balance on car trusts and $150,000 for new terminal facilities.

Oregon Railway & Navigation Co.—The franchise of the Washington & Idaho road has been transferred to this company. The road is projected to extend from Farmington, Washington Territory, northeasterly to the Cœur d' Alene mines, in Idaho, and little or no work has been done upon it.

Oroville & Beckwith.—Articles of incorporation filed in California to build a standard gauge road from Oroville, Butte County, northwesterly, following the course of Feather River to Beckwith, an estimated distance of 100 miles. Oroville is the northern terminus of the Northern California road, and Beckwith is the western terminus of the Sierra Valley & Mohawk road.

Paragould & Buffalo Island.—The survey for the road from the end of the graded track, 8 miles toward the Missouri state line, will be completed this month and the road constructed this year. John B. Boykin, Paragould, Ark., is Chief Engineer.

Paris, Marshall & Sabine Pass.—Contracts will be let immediately for the construction of an extension of the road from Montvale Springs northwest 28 miles to Gilmer, Tex., on the St. Louis & San Francisco. The road has been surveyed to Paris and 23 miles graded south from that point. Between Marshall and Montvale Springs the road is in operation. The road as projected extends from a point on the Red River northwest from Paris, thence through Paris, Marshall and to the Louisiana state line east of Marshall and from Marshall to Sabine Pass, a total distance of about 400 miles. No bonds have as yet been issued, all the work so far being completed from subscriptions to the capital stock, which is at the rate of $10,000 per mile. W. H. Heartsill, Marshall, Tex., is General Manager.

Philadelphia & Chester Valley.—The formal deed of transfer of the road and properties of the Chester Valley road to the reorganized company was recorded last week in Norristown, N. J.

Pittsburgh & Castle Shannon.—The directors have called a general meeting of the stockholders to be held in Pittsburgh, Pa., June 8, to consider a report of the directors submitting a plan for extensive improvements and also to decide whether new bonds shall be issued to take up the present outstanding issue of $59,900 of first mortgage 7 per cent. bonds due April, 1890. The directors contemplate building an inclined plane road at Pittsburgh for conveying passengers and freight from the present terminus of the road down to the business portion of the city at an estimated cost of $110,000, including the purchase of right of way.

Pittsburgh, Marion & Chicago.—The company has arranged for running rights over the tracks of the Cleveland & Canton, between Minerva and Beach City, 35 miles, to be used when the contemplated extension to Marion, O., is completed.

Pontiac & Pacific Junction.—The road has been extended from Coulonge to Black River, 10 miles, and the survey has been made to Pembroke, Ont., 14 miles further. Five bridges in succession will be erected across the Ottawa River. W. Hale Harris, Aylmer, P. Q., is Chief Engineer.

Rockaway Valley.—The contract for constructing this road, which is to extend from New Germantown to White House, N. J., 5 miles, has been let to J. P. Brothers, and grading was commenced May 15, and is to be completed Aug. 1. The road connects at White House with the Central of New Jersey, which will operate it. J. E. V. Mellick, White House, is the Chief Engineer.

Salt Lake & Fort Douglas.—It is proposed to extend the road, which is now being built from Salt Lake easterly

to Fort Douglas, to Cottonwood, Salt Lake County. John W. Young, Salt Lake City, Utah, is President.

Santa Ana & Tustin Motor.—Incorporated in California to construct a "motor" road from Santa Ana easterly to Tustin City. The capital stock is $100,000.

San Antonio & Aransas Pass.—The branch south from Skidmore to a connection with the Mexican National at Kleberg has been completed to within 12 miles of the latter place. It is said that a third rail will be laid on the Mexican National to Laredo.

San Diego & Elsinore.—Dispatches announce that the Southern Pacific has purchased this road, and will complete it to San Diego. The road connects with the Southern Pacific at Elsinore, Cal.

San Diego, Old Town & Pacific Beach.—Articles of incorporation filed at San Diego, Cal., by A. G. Gasson, R. A. Thomas, E. W. Morse and others.

Santa Rosa & Carquinez.—The grading has been finished into Santa Rosa, Cal., from Glen Ellen, completing the grading on the entire road from Napa Junction to Santa Rosa, about 37 miles. The tracklaying will probably be completed early in June.

Soo & Southwestern.—Incorporated in Wisconsin to construct a two-mile road from a point on the Chicago, Burlington & Northern, just north of Alma, Buffalo County, across the Mississippi River to some point in Wabasha County, Minn. The capital stock is $1,000,000.

Southern Pacific.—Articles of consolidation have been filed in California of the various lines which have hitherto been leased or operated under traffic agreements. The capital stock is $142,990,000, in shares of $1,000. The stockholders of each corporation included in the consolidation are to have the same number of shares of stock in the consolidated company as they hold in the capital stock of the different companies in which they are interested that are included in the consolidation.

Two forces of graders are at work grading for the double track between Oakland and Port Costa, 22 miles.

A contract for the construction of a road from Orting through the canyon of the Carbon River to Carbonado has been made with Nelson Bennett. This will necessitate the construction of two tunnels.

The company is having considerable difficulty in securing the right of way for a proposed extension of the Northern Division from Monterey, Cal., southerly through Pacific Grove to Cypress Point, about 8¼ miles.

Stockton & Tulare.—The grading forces on this road have reached Porterville, in the eastern part of Tulare County, Cal., and tracklaying is also progressing. A survey is being made from Fresno to Oaknale. The road is a branch of the Southern Pacific, and is being constructed from Oakdale southerly through the eastern part of the San Joaquin Valley, and will rejoin the main line at Poso, Kern County, and with its branches will be about 262 miles long.

Tehuantepec.—It is stated that the contract for the construction of the road has been let to a London syndicate. The road is to be completed in four years, and will be owned by the government, which will pay the construction company five per cent. interest on the cost. First mortgage bonds are to be issued in London by the company. The line across the Isthmus of Tehuantepec will be about 334 kilometers in length. About 108 kilometers have been constructed, but it is thought that this portion will have to be rebuilt. The construction company also agrees to build a wharf at Salina Cruz, on the Pacific coast.

Tennessee Midland.—It is expected that the tracklaying between Memphis and Jackson, 85 miles, will be completed this week, and the road will be opened for traffic soon after. Grading is progressing east of Jackson, and the location has now been completed to near Nashville.

Texas Western.—The United States Circuit Court in Galveston, Tex., has ordered that the road suspend business after the first of June until further orders from the Court. The rolling stock is ordered housed, the property to lie in the custody of a receiver at a salary not to exceed $50 per month. A petition has been filed in the United States District Court at Galveston, by employés of the road, for the lease of the line and equipment from June 1 to Jan. 1, 1889, at $250 per month.

Toledo, Ann Arbor & North Michigan.—The second and probably final survey is now being made for the proposed extension from Cadillac northward to Frankfort, on Lake Michigan, 63 miles.

Toledo, Saginaw & Mackinaw.—Tracklaying will be commenced this week at East Saginaw, Mich., and will be completed as quickly as possible to Durand, 53 miles. G. T. Wiswell, of Chicago, has the contract for grading and McRae, Lally & Son, of Detroit, Mich., the contract for grading.

Utica, Adirondack & Saratoga.—The company has been incorporated in New York, and preliminary survey is being made by W. A. Roberts, Cobbleskill, N. Y., from Prospect, Oneida County, on the Rome, Watertown & Ogdensburg, northeasterly about 20 miles through Gang Mills and Grant to Morehouseville, in Hamilton County. When this is completed a second line will be run following the north side of West Canada Creek, and passing through Northwood to a point at or near Pisego Lake.

Virginia, North Carolina, Tennessee & Western.—Articles of incorporation filed in Tennesse to construct a road from a point on the North Carolina & Tennessee line, in Johnson County, westerly to some point on the Tennessee River in Stewart County.

Washington & Idaho.—The company has passed into the control of the Oregon Railway & Navigation Co.

Western Ontario.—The company proposes to construct a line from Port Hope to Inverburon, Ont., a distance of about 176 miles.

Winona & Southwestern.—Dispatches state that grading was commenced Mason City, Ia., May 16, and that a contract for 16,000 tons of steel rails has been placed.

Wisconsin Midland.—The preliminary survey for the proposed extension from Fond du Lac to Madison, Wis., has been completed to Columbus on the Chicago, Milwaukee & St. Paul, and will reach Madison in a few days.

TRAFFIC AND EARNINGS.

Traffic Notes.

The Central Traffic Association and Trunk lines have agreed to reduce the rates on live stock from Chicago to New York to 25 cents per 100 lbs., a reduction of 10 cents. The dressed beef rate remains at 65, the reduction on live stock being made to meet the low rates at which dressed beef is being carried by the Grand Trunk.

The Trunk lines have reduced west-bound lake and rail rates to a basis of 44 cents, first-class, New York to Chicago. This is the rate which the Chicago, Burlington & Northern agreed upon with the Central Vermont a week ago. The rail and lake rate from Boston to St. Paul by the Lake Superior lines was last week reduced to a basis of 60 cents first-class—a reduction of 15 cents. The rates from New York, were reduced to the same basis May 17.

Lake rates on grain from Chicago, which at the opening of the season were very low, have dropped still further, corn being taken to Buffalo at 1¾ cents per bushel. Wheat has been taken from Duluth to Buffalo at 3¼ cents. Vessels passed through the Sault Ste. Marie Canal May 8, three days after the opening of the Straits of Mackinaw, but much trouble has been encountered from the ice in Lake Superior. Rates on coal from Buffalo have advanced slightly, quotations being 85 cents to Chicago.

Canal rates from Buffalo to New York are 3½ cents per bushel for wheat and 3¼ for corn.

The Delaware & Hudson Canal Co.'s roads now sell 1,000-mile tickets for $20, which will be good for *bearer* until used.

Iowa Rates.

The Iowa Railroad Commissioners have, in accordance with the new law of that state, appointed dates for hearing suggestions concerning the fixing of a schedule of maximum freight rates, and a classification. The hearing will be held in the office of the Commissioners at Des Moines and will be as follows: For jobbers, May 17-18; manufacturers and millers, May 22; pork packers and stock shippers, May 23; coal mine operators, coal and lumber dealers, May 25; producers, May 29-30; retail merchants, middlemen and all others, May 31; common carriers, June 5.

It appears that the local rates adopted by the Iowa roads in compliance with the new law, have been hastily made up, and have been arranged simply to come within the maximum limit prescribed by the Commissioners. Many of the rates are therefore higher than those formerly existing, and will consequently make disturbance at many points, as, for instance, those places which compete with towns in the region of St. Paul on shipments to Chicago. An attempt has been made to get the Northwestern roads to advance their rates to and from Chicago, so as to equalize the Iowa and St. Paul tariffs, but no action has as yet been taken in that direction.

Castle Garden Ticket Agency.

All the trunk lines except the Delaware, Lackawanna & Western have combined to establish a joint agency for first and second-class passengers in New York City near Castle Garden. It has been agreed that the Baltimore & Ohio may take second-class passengers on a basis of $16 to Chicago.

Railroad Earnings.

The statement of the earnings and expenses of the New York Central & Hudson River for the quarter and half year ending March 31 is as follows:

Three months—ending March 31:

	1888.	1887.		Changes.
Gross earnings	$8,152,796	$8,089,351	I.	$63,444
Op. expenses	5,802,027	5,503,895	I.	293,132
Per cent. of exp	71.16 p. c.	68.10 p. c.		
Net earnings	$2,350,768	$2,580,456	D.	$229,687
Fixed charges	1,954,860	1,957,200	D.	2,340
Profit	$395,908	$623,256	D.	$227,347
Dividend 1 p. c.	894,283	894,283		
Deficiency	$498,374	$271,026	I.	$227,347

Six months—ending March 31:

Gross earnings	$18,173,021	$17,110,607	I.	$1,062,414
Op. expenses	12,272,538	10,967,644	I.	1,304,893
Per cent of exps	67.53 p. c.	64.10 p. c.		
Net earnings	$5,900,483	$6,142,962	D.	$242,479
Fixed charges	3,909,720	3,914,400	D.	4,680
Profit	$1,990,763	$2,228,562	D.	$237,799
Dividend 2 p. c.	1,788,566	1,788,566		
Surplus	$202,197	$439,996	D.	$237,799

The following is the report for the quarter ending March 31 of the Buffalo, Rochester & Pittsburgh:

	1888.	1887.
Gross earnings	$479,247	$385,418
Operating expenses	381,036	303,424
Net earnings	$98,211	$81,994
Other income	1,507	30,442
Gross income	$99,718	$112,436
Fixed charges	130,357	112,175
Deficit	$30,638	
Net income		$261
Cash on hand	209,719	60,025
Surplus	22,095	14,467

The following is the annual report of the St. Louis & San Francisco for 1887 as compared with last year:

	1887	1886	Increase.
Mileage	1,095	878	217
Earnings	$6,229,344	$4,874,628	$1,354,716
Expenses	2,668,099	2,049,033	619,066
Net	$3,561,245	$2,825,595	$735 650
Taxes and improv.	313,768	173,263	140,505
Balance	$3,247,477	$2,652,332	$595.145
Other income	184,800	159,620	22,180
Total	$3,429,277	$2,811,925	$617,325
Int., s. f. and rentals	2,211,369	1,956,298	255,071
Balance	$1,217,908	$855,654	$362,254
Dividends	565,000	315,000	250,000
Surplus	$652,908	$540,654	$112,254

The statement of the Cincinnati, Indianapolis, St. Louis & Chicago for the month of March shows:

	1888.	1887.	Inc. or Dec.
Gross earnings	$212,984	$234,712	D. $21.728
Op. expenses	129,679	137,136	
Net earnings	$83,305	$97,576	D. $14.271
Total 9 mos.	114,096	340,266	D. 74,429

The statement of the earnings and expenses of the Rome, Watertown & Ogdensburg for the quarter ending March 31, as filed with the Railroad Commissioners at Albany, is as follows:

	1888.	1887.	Inc. or Dec
Gross earnings	$686,518	$638 971	I. $47,547
Op. expenses	440,256	402,719	I. 37,537
Net earnings	$246,262	$236,252	I. $10,011
Other income	8,087	7,986	I. 101
Total income	$254,349	$244.238	I. $10,110
Fixed charges	226,643	259,344	D. 32,701
	$27,706	def. $15,004	I. $42,602
Cash on hand	321,320	301,740	I. 10,580
Surplus	$945,674	$308,438	I. $637,236

The annual report of the Canadian Pacific makes the following comparisons:

Year.	1887.	1886	Inc. or Dec
Passenger	$2,453,818	$3,170,714	I. $283,104
Freight	d 924,130	6,112,380	I. 811,750
Mail, ex and misc	1,228,463	798,710	I. 429,753
Total	$11,606,412	$10,081,804	I. $1,524.608
Expenses	8,102,294	6,378,317	I. 1,733,977
Net	$3,504,118	$3,703,487	D. $199,369
Fixed charges	3,250,263	3,068,042	I. 182,221
Surplus	$253,855	$635,444	D. $381,589

Earnings of railroad lines for various periods are reported as follows:

Month of April:

	1888.	1887.	Inc. or Dec.	P c.
Atlantic & Pac.	$238,330	$285,892	D. $47,562	16 5
Buff., R. & Pitts.	134,806	184,690	D. 49.884	26.0
Bur., C. R.& Nor.	193,176	235,216	D. 42,040	17.8
Cairo, V. & Chic.	54,243	50,022	I. 4,221	8.0
California South.	147.924	132.461	I. 15,463	11.3
Canadian Pac.	1,028,000	850,399	I. 177,601	20 8
Cape F. & Y. Vy.	22,190	18,929	I. 3,261	16 6
Central of Iowa.	101.828	89,824	I. 12,004	13.4
Ches., O. & S. W.	1'8,578	127.364	I. 11,214	8 6
Chic. & Atlantic.	217.412	168,700	I. 48,712	28.5
Chi. & East. Ill.	152,458	154.262	D. 1.804	0.6
Chi. & Ind. Coal.	34.073	26,975	I. 7,098	26 9
Chi., Mil. & St. P.	1,825,000	1,979,661	D. 154,661	7.8
Chic. & Ohio R.	4,294	4.503	D. 209	4.6
Chi. & W. M.	120,145	112,314	I. 7,831	6.2
Cin., J. & Mack.	39,404	32,951	I. 6,453	18.7
Cin., N. O. & T. P.	273.667	246,523	I. 27,144	10.9
Ala. Gt. South.	116,067	110.954	I. 5.113	4.5
N. Ori. & N. E.	65,522	46,432	I. 19,090	41 2
Vicks. & Mer.	33,780	32,057	I. 723	2.2
V., Shre. & P.	34,172	29,292	I. 4,880	13.8
Cin., R. & Ft. W.	31,359	34.444	D. 3,085	8.8
Cin. & Springf'd.	88.058	90,613	D. 2,555	2.2
Cin., W. & Balt.	151,594	140.647	I. 10,947	7.1
Cleve., Ak. & Col.	47,457	46,988	I. 469	0.9
Cl., C., C. & I.	301,520	317,389	D. 15,869	4.7
*Col. & Cin. Mid.	15,556	15,102	I. 454	3.0
Col., H. V. & T.	204,838	228,004	D. 23,166	10.0
Den. & R. G.	563.700	565,744	D. 2.044	0.3
Den. & R. G. W.	96.125	75.619	I. 20,506	28.0
Det., B. C. & Al.	38,000	32,987	I. 5 013	15.6
Det., Lan. & No.	79,740	89.804	D. 10.064	11.2
aDu., S. S. & At.	79,079	60.721	I. 18,358	30.0
E. Ten., Va. & G	408.891	362,766	I. 46,125	12.7
Ev. & Indianap.	17.449	15,415	I. 2,034	13.3
Ev. & Terre H.	63,759	69,845	D. 6 086	8.7
Flint & P. M.	226,450	228,973	D. 2,523	1,1
Fla. Ry. & N. Co.	88,523	86,909	I. 1,614	1.1
*Ft. W.& Den.,C.	57.369	44,282	I. 13,107	29.5
Georgia Pacific.	91,999	80,169	I. 11.830	13.7
Gr. Rapids & Ind.	180,327	194,263	D. 13 936	6.7
Other lines.	17,339	15,705	I. 1,634	6.6
†Grand Tr. of Can	1,361,143	1,387,252	D. 26,109	1 8
Houston & T. C.	158,852	145,357	I. 13,495	8.9
Hum. & Shen.	9,500	10,494	D. 994	9.3
Ill. C. (I & S. Div.)	859,196	793,761	I. 65,435	8.1
Cedar F. & M.	6,635	10.046	D. 3.411	30.0
Dub. & Sioux C.	67,455	59,729	I. 7.726	11.9
I. F. & S. City.	50.743	43.778	I. 6,965	13 9
Kanawha & Ohio.	20,485	8,500	I. 11.985	137 4
*K. C., Ft S. & G.	118.816	132.705	D. 13.889	9 8
*K.C.,Sp. & Mem.	81,547	100,940	D. 19,393	19.0
*K. C.,Cl. & Spr.	12.429	13,236	D. 807	6.1
Kentucky Cent.	68.737	77,399	D. 8,662	10.4
Keok. & West.	24,051	21,630	I. 2,421	9.5
Kingston & Pem.	16.074	14.737	I. 1,317	7.1
Lake E. & W.	147 926	139,018	I. 8,908	5.7
Lehigh & H. R.	19 924	20,269	D. 345	17.3
*L. Rk. & M.	37,815	36,873	I. 942	2.6
Long Island	251,749	231,206	I. 20.543	8.6
Lou., Ev. & St. L.	71,496	80,361	D. 8.865	10 0
Louisv. & Nashv.	1,166.440	1,179,276	D. 12,836	1.0
Louis., N. A. & C.	161,938	160,186	I. 1,752	0.6
Lou., N. O.& Tex	152,188	116,198	I. 35,990	30.1
Memphis & Chas.	120,445	117,293	I. 3,152	2.5
‡Mexican Central	457,586	364,108	I. 93,478	25 5
‡‡Mexican Rail.	221.540	231.372	D. 9 832	3.9
Mil., L. S. & W.	188,863	241.590	D. 52,727	21 5
Mil. & Northern.	86 955	79,869	I. 7,086	8.9
Minn. & St. L.	118,650	133,067	D. 14.417	10.5
Mobile & Ohio.	169,174	154,407	I. 14.767	9.0
Nat.,Jack. & Col.	10,261	10,536	D. 275	2.6
N. Y. C. & H. R.	2,748,777	2,901,740	D. 152,963	5.3
N. Y. & Northern	45,926	45.160	I. 766	1.7
N. Y., O. & West.	131,797	118,268	I. 13.529	11.0
Norfolk & West.	373,036	298,842	I. 74,194	2.4
Northern Pacific.	1,412,700	1,121,006	I. 291,694	25 9
Ohio & Miss.	270,521	300,294	D. 29,773	9.6
Ohio River.	30,162	20,864	I. 9,298	45 0
Ohio Southern	36,751	45.090	D. 8 339	17.7
Pitts. & West	130,106	168,093	D. 37,987	22.0
Rich. & Danville.	336,800	313,829	I. 22,971	7.0
Virginia Midl.	125,725	114,000	I. 11.725	9.6
Char., C. & A.	59,800	54,089	I. 5,711	9.2
Col. & Gr. Div.	35,950	30,649	I. 5,301	16.6
W.N.Car. Div.	59,100	56,807	I. 2,293	3.6
W.O.& W.div.	9,050	9,100	D. 50	0.5
Ashev.& S. div.	7,600	3.722	I. 3.878	100.0
§St. L., A.& T. H.	150,707	143 823	I. 6,884	4.2
Branches	62,728	76 267	D. 13.539	17.1
St. L., A. & Tex.	171,813	139,786	I. 32,027	23.0
St. L. & San F.	415,272	473,261	D. 57.989	12 0
St. P. & Duluth.	105,607	93,016	I. 12,591	12.9
St. P., M. & Man.	810,359	686,658	I. 123 701	17.9
San A. & Aran. P.	86.144	34,070	I. 52,074	152.9
Shenandoah Val.	65,000	65.088	D. 88	0.1
Staten Is. R. T.	54,000	52,450	I. 1 550	1.9
Texas & Pacific.	472,756	377.654	I. 95,702	25.2
Tol., A. A.& N. M.	47,390	37,654	I. 9,736	24.3
Tol. & Ohio Cent.	83.754	73,262	I. 10,492	13.7
Tol., P. & West.	66,581	58.971	I. 7.610	12.0
Valley (Ohio).	54.038	52,156	I. 1,882	1 9
Wabash West.	435,222	435,169	I. 53	...
West. N. Y. & P.	220,000	231,502	D. 11,502	4.7
Wheeling & L. E.	74,177	64,435	I. 9.742	14.0
bWisconsin Cent.	304.099	285,848	I. 18,251	6.3
Total	$23,556.242	$22,814,006	I. $742,236	3.2

* Includes three weeks only of April in each year.
† Four weeks ended April 28.
‡ Mexican currency.
§ Including Indianapolis & St. Louis.
a Including Detroit M. & Marq. and Marq., Hough. & Ont.
b All lines.

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

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